### South End Gives Back

A Washington non-profit Corporation Brad Nicholson, *President* 

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September 24, 2015

Mr. Phil Olbrechts Renton Hearing Examiner 1055 South Grady Way Renton, Washington 98056 CITY OF RENTON

SEP 24 2015 2:19pm

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CITY CLERK'S OFFICE

RE: Timely Notice of Appeal of LUA-09-151 FEIS Adequacy Decision

RE: \$250.00 appeal fee included

Dear Mr. Hearing Examiner,

The above noted adequacy decision speculates and presumes a specific baseline environmental condition and then overlays only one significant storm water management alternative onto that presumption. The decision is invalid.

"Alternatives to a proposed action" and the discussion of alternatives forms the "Heart of an Environmental Impact Statement" see *Alaska v. Andrus* 580 F2d 465, *Western Oil and gas v. Alaska* 439 U.S 922, 99 Supreme Ct. 303, 58 L. Ed. 2d 315.

An Agency "may not define its objectives so narrowly that only one alternative emerges from among the environmentally benign ones" citing *City of New York v. Department of Transportation* 715 F.2d at 715 The un-phased and so called "Final" decision "defines" one speculative site configuration then dictates one method of protecting water when they "may not do that" *id. est.* 

Upon review, our courts affirm the significance of storm water pollution. See Storedahl Properties LLC v. Clark County 143 Wn. App. 489. Stating, "The EPA identifies storm water runoff as (verbatim) "the most significant source of water pollution today" (emphasis supplied) finding, "Impervious surfaces significantly increase the volume and velocity of runoff and the amount of pollutants in storm water" (emphasis supplied)

In *Trout Unlimited v. Morton* 509 F. 2d 1276, 1285 the court found that an "EIS must cover a whole project when the dependency is such that it would be irrational or unwise to undertake the first phase if the second phase is not also undertaken" Of course, no disclosure on the remediation outcome has been included in the FEIS decision because it has yet to take place.

One would want to inquire why then is it so necessary or what is the wisdom to proceed with making the decision when the project is so dependent upon the outcome of an unaccomplished superfund process.

#### The FEIS states:

C10. If EPA issues a ROD that is different than what is assumed in the Quendall Terminals EIS, the City reviewing official shall determine whether the applicant shall be required to prepare additional SEPA review, including a possible Supplement to the EIS or Addendum to the EIS, to address any differences between the ROD and the assumptions in the EIS.

The FEIS (Final Environmental Impact Statement) attempts to persuade the readers that the narrow speculative condition of merely covering over the entire site without a cleanup and then adding straight pipe water discharges is "adequate" consideration that could possibly be supplemented, and does nothing to observe the above procedural requirements.

The CERCLA process is supposed to have public participation, where the remedy could be influenced to include infiltration or other measures. They don't even know for certain "the soil cap" is what will be decided without having had conducted the review. That way is very dangerous, for example in *King County v. Boundary Review Board* 122 Wn.2d 648, P.2d 1024 the court adopted the fact sensitive approach as opposed to the categorical approach because RCW 43.21C.031 mandates an EIS must be complete when significant adverse impacts on the environment are "prob-able", not when they are "inevitable"

The categorical approach leads to results contrary to the purposes of SEPA. Citing Stempel v. Department of Water Resources, 82 Wn.2d 109, 118, 508 P.2d 166 (1973); Loveless v. Yantis, 82 Wn.2d 754, 765-66, 513 P.2d 1023 (1973). The court stated that "Decision-making based on complete disclosure would be thwarted if full environmental review could be evaded simply because no land use changes would occur as a direct result of an immediate governmental action. The court articulated that even a change such as a boundary line change, may begin a process of government action which can "snowball" and acquire virtually unstoppable administrative inertia. Pointing to Rodgers, The Washington Environmental Policy Act, 60 Wash. L. Rev. 33, 54 (1984) (the risk of postponing environmental review (as here) the court then quoted that the result is "a dangerous incrementalism where the obligation to decide is postponed successively while project momentum builds"). Also citing Settle, supra at 103 stating "would induce expectations of environmentally significant development which future decision makers may be reluctant to disappoint")

The case, like here, went on to articulate that even if adverse environmental effects are discovered later, the inertia generated by the initial government decisions may carry the project forward regardless. The court stated, "When government decisions may have such snowballing effect, decision makers need to be apprised of the environmental consequences before the project picks up momentum, not after"

It was then held by the court that a proposed land use related action is not insulated from full environmental review simply because there isn't a current specific proposal (for example: the ROD and Site wide ready for Re-use measure that is absent here) to develop the land in question or because there are no immediate land use changes which will flow from the proposed action. Instead, an EIS should be prepared where the responsible agency determines that significant adverse environmental impacts are probable following the action.

There are numerous ways to manage runoff that would result in much lower impacts even on a totally impervious site even if the cap were to be the case and those methods could fulfill the consideration. As shown herein, more than one way must be considered for one reason the area is described as "Prime Chinook Salmon Habitat" see *EPA Narrative attached*) It's very near to where people (including SEGB) have and/or need recreation see *EPA Narrative attached*). The decision places SEGB and myself in the difficult position of attempting to comment further and/or establish a challenge about our interests and the above in at least two jurisdictions with what logically is second stage first, as shown by the lack details of the EPA's (U.S. Environmental Protection Agency) ROD (Record of Decision), or PP (proposed plan) performed under CERCLA (U.S. Comprehensive Environmental Response and Compensation Liability Act) having yet to be completed. Additionally, there has yet to be an opportunity to comment on the EPA processes identified above.

It should be stated in the decision that our State's SEPA statute requires environmental information to be contained in a single environmental document, and requires the document to have had been developed with public participation instead of issuing a "Final" "if/then" statement. It now follows, therefore, that SEGB and Brad Nicholson contend that in determining whether an adequate EIS was prepared we will be guided in large part by the "procedural rules" rooted in the above and herein case law. No synthesis of these rules should be attempted other than to point out that all such rules have been designed so as to assure that the EIS serves substantially the two basic purposes. That is, that the EIS is in compliance with SEPA when its form, content, and preparation substantially (1) provide decision-makers with an environmental disclosure sufficiently detailed to aid in the substantive decision whether to proceed with the project in the light of its environmental consequences, (which it does not) and (2) make available to the public, information of the proposed project's environmental impact and encourage public participation in the development of that information. (which it does not)

In order to find that the FEIS is adequate, you will find that it is necessary to close your eyes to the obvious omissions of significant multiple actions and their impacts going on simultaneously, and forget about trying to encourage considering the public and the required procedural rules, and forego considering alternatives because for reason number one you will not even know what the starting configuration of the site will be when you look at these workings. The cleanup should be first. The decision, for want of more, considers mitigating whatever is "appropriate" utilizing "energy dissipation structures" it is not detailed or thoughtful at all. Right now would be a good time to take the requisite "hard look" necessary for such decisions. See Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 350 (1989). Before taking major actions agencies are required to prepare an Environmental Impact Statement ("EIS"). 42 U.S.C. § 4332(2)(C). An EIS must take a "hard look" at the potential environmental impacts of the proposed action. Robertson, 490 U.S. at 350; New Mexico ex rel. Richardson v. Bureau of Land Management, 565 F.3d 683, 713 (10th Cir. "The EIS must also 'rigorously explore and objectively evaluate all reasonable alternatives' to a proposed action in comparative form, so as to provide a 'clear basis for choice among the options." See WildEarth Guardians v. U.S. Forest Serv., 828 F. Supp. 2d 1223, 1236 (D. Colo. 2011) (quoting 40 C.F.R. § 1502.14).

We at SEGB request that you articulate that the ERC process of analyzing water quality is severely inadequate and that the procedures used cannot muster consistency with WAC 197-11-060 (3) (a.) (iii.) and (b.) (i.)(ii.). or the definition of "Reasonable Alternative" WAC 197-11-796, or "Scope" WAC 197-11-792, while the procedural content WAC 197-11-440 (5) (a.) (b.) c.) (d.) is unincorporated. They are evidently just trying to gain vesting, which should not be allowed when the application is so very completely incomplete. The actual baseline conditions on the application and SEPA's required Environmental Checklist must be blank. The FEIS only considers the following:

A10. A permanent stormwater control system shall be installed in accordance with the applicable stormwater regulations.

A11. Offshore outfall locations for stormwater discharge from the permanent stormwater control system shall be equipped with energy dissipation structures or other devices to prevent erosion of the Lake Shoreline and bottom.

B7. A permanent stormwater control system shall be installed consistent with the applicable requirements. The system shall collect and convey stormwater runoff to Lake Washington via a tight-lined system or another system approved by the City's responsible public official. Water quality treatment shall be provided for runoff from pollution-generating surfaces to prevent water quality impacts to the lake and shoreline wetlands.

Perhaps further processes by the EPA will contain consideration of reasonable alternatives and exercise of substantive authority, but they haven't taken place yet so that is also speculative and unknown. There is no way to ascertain that EPA's ROD cannot be influenced in such a way that at least some of the site can be made capable of infiltration (which is the contrary to the presumption) We at SEGB want the Examiner to know how to proceed, Environmental review should take place at the earliest possible stage, see Alpine Lakes v. Natural Resources 102 Wn. App.

For most people the segmentation makes such a look and intelligent comments too formidable. There is no indication that infiltration or retention is being considered here. But, "Whether an environmental impact statement needs to be prepared in a particular instance (including reasonable alternatives) (supplied) does not necessarily depend upon the existence of a specific development proposal. "Under RCW 43.21C.031, an environmental impact statement is required whenever a major action by a government agency will have a probable significant adverse environmental impact. Again put another way, "One purpose of the State Environmental Policy Act (chapter 43.21C RCW) is to provide consideration of environmental factors at the earliest possible stage to allow decisions to be based upon complete disclosure of probable environmental consequences. *Alpine Lakes*. It should be noted that no environmental consequences due to the lack of alternatives have been identified in the document. The DEIS enunciated that the same storm water plan that has been incorporated into the FEIS is "non-significant" (DNS)

It is possible to look to *King County v. Cent. Puget Sound Bd.* 91 Wn. App. That clarifies, stating, "for purposes of RCW 43.21C.030(2)(c)(iii), which requires that an environmental impact statement include a detailed statement regarding the alternatives to the proposed action,

and WAC 197-11-440(5)(b), which defines a "reasonable alternative" as an action that could feasibly attain or approximate a proposal's objectives but at a lower environmental cost or decreased level of environmental degradation, "an alternative need not be legally certain or uncontested in order to qualify as a "reasonable alternative" or to be included in an environmental impact statement. (emphasis supplied) King County v. Cent. Puget Sound Bd.

We at SEGB believe the position should be affirmed that if there was a good Builder of a project such as this, He would be a steward of the environment and would be wanting to start hammering away at consideration of all reasonable alternatives, as opposed to stubbornly outlining that if the straight pipes can't go in then no action alternative will be exercised. However that is what is happening and the ERC has reinforced exactly this wrong posture with this decision. Undoubtedly, that is very much the same posture taken by the O'Reilly Tar and Chemical company started many years ago that has created this quagmire by dumping 455,000 gallons of creosote into the ground water. O'Reilly did not think. Like a child, the developer must have his way or he will sit and pout and do nothing, turning Lawyers onto the land rather than have cleanup crews, cooperation, and well thought out quality development. SEGB and Brad Nicholson oppose such processes and ask that they be changed.

The average annual precipitation for Renton is 37 inches; 1 acre of impervious surface will generate approximately 1,000,000 gallons of polluted storm water runoff per year, adversely impacting citizens. For 22 acres or 950,000 square feet of impervious surface as a result of the above presumptions, the rate would be 22,000,000 gallons per year, or an average of 60,000 gallons of runoff every single day. To check and verify calculations see Environment Education Guide, Protecting Washington's waters from stormwater pollution Ecology Publication #07-10-058 (attached) The FEIS presumes the entire site (around 22 acres) as impervious with a soil cap of sand or organic-clay. See FEIS. Considering the probable deficiencies in transportation capacity from up to 800 new single family units, the impervious area as a direct result of the presumption is extremely likely to go up. We at SEGB will not be entertained by Proponents that may contend that calculations are not accurate and then identify zero flow control. Using conservative numbers, there would be 1,320,000,000 (1.32 billion) gallons of polluted runoff discharged from Quendall Terminals in the next 60 years. As shown herein, there is an abundant plethora of polluting substances contained in that runoff. What difference or case could be made if say, it is too difficult to determine whether a discharge can be reduced by either 45% or 55 % instead of 0%

Pollution in storm water runoff is widely considered to be one of the main sources of the 52 million pounds of harmful pollution that end up in Puget Sound each year. See *Q&A Earthjustice*, attached. Evidently they realized this, because the FEIS removed the DNS nomenclature but still charges ahead with exactly the same straight pipes discharging from an unknown site configuration. Presumably they are sticking with, but attempting to hide the DNS decision, because nothing has been altered in their approach.

In addition to erroneously deciding that the plan need not divulge any of the details of "water quality treatment" its apparatus' and/or facilities that would be used, or make any attempt to divulge the pollutants that would be discharged, the approach used does not include any data about how conserving the wetlands, or using LID for example not cutting down the 450 trees (vegetative uptake) on the site (EIS) could be used in conjunction with better processes to

reduce the amount of discharge of pollution and achieve better numbers for the Lake and Puget Sound. The FEIS for want of more states that whatever is "appropriate" (word used in FEIS) will be used. The ERC is admitting that they don't care and have not considered the facts before the decision was arrived at by finding such a statement as whatever is "appropriate" to be adequate. See *Sisley v. San Juan County 89 Wn. 2d 78* It is necessary to consider the facts and circumstances and SEPA's terse procedural requirements before a decision is made. We can be certain that they don't know even know what they are doing, because they don't even know the site they are talking about. They think a FEIS consists of articulating that they will do whatever is "appropriate" There was not much thought that went into that mitigation measure.

One thing they did recognize in the FEIS is the complete lack of comprehensive storm flow control analysis by calling for the installation of massive "energy dissipation structures" to mitigate damage to the lake bottom from the billions of gallons of unrestricted flow off of the site from the proposed three "outfall" straight pipes that would discharge almost every contaminant entering the system. They have proposed that the shoreline be "trenched" to a location "offshore" and then when and where efficient to do so, put the poorly conceived "energy dissipation structures" in place.

In other jurisdictions, way more conscientious planning work, detailed disclosure, and contemplation has taken place (and reasonable alternatives have been considered and incorporated into their decisions), information is abundant and it is all free for the taking-for example see *Chevy in the Hole*, *Design principles for Stormwater Management on Compacted*, *Contaminated soils in Dense Urban Environments* EPA Document 560-F-07-231 Apr. 2008 attached. Many of those ideas are feasible and beneficial for use on this site, would result in decreased environmental impacts and better water quality, WAC 197-11-440(5)(b), and would not effect the eventual approval still allowing the proponent to achieve the objectives of the project. But we would be stuck with a guy that wants to make millions of extra dollars with the straight pipes.

The acronym "LID" is referred to for many of the techniques (Low Impact Development)

On the high intensity land use *Chevy* Superfund site described above, the export concentrations of toxic contaminants would have been the highest of any land use, while expensive retrofitting of similar existing development types and low impact development techniques are needed. Also see Conclusion, *Control of toxic Chemicals in Puget Sound* Ecology Publication No.11-03-010. The Proponents can find any of these exhibits online just like SEGB has. They have evidently refused to do so.

Some of our leaders probably dictated that the EIS authors just take the quick and easy way out of trying to do a small amount of work; they reassure them to use straight pipe discharge according to the Developer wishes or he might just sit there. The pipes don't have enough resistance to worry about calculations, i.e. it is so rapid that it does not matter. Infiltration and/or flow control that has been disclosed = zero. No complicated calculation is necessary.

It is precisely the type of significant impact that we have spent millions if not billions of dollars trying to remedy using State resources developing plans, with a developer that perhaps will contend that they are not feasible. see Low Impact Development Technical Guidance Manual for Puget Sound - Puget Sound Action Team

One of the important unconsidered reasonable alternatives is simple to design Green Roof systems that can reduce the quantity of discharge from their hot roof surfaces by 50% through evaporation-transpiration, and in combination with the menu of other LID techniques like leaving some trees, making the houses a little smaller, membrane under pervious pavement w/underdrain, or creating water features such as flow-thru-landscaping that recycle or store water into that landscaping, the massive energy could be nearly eliminated-and with no straight pipes. On a life cycle basis they cost no more than straight pipe high impact techniques and have the advantage of reducing energy usage, limiting resource usage by being recyclable. These principles and techniques are commonplace in many other jurisdictions. In this case, the temperature of the discharge and of the buildings would be significantly reduced. They work very well on larger projects. See LID Technical Guidance Manual for Puget Sound. Many of our exhibited documents list resources galore for the alternatives.

Nothing in the EIS considers dissipating the thermal waste their presumptions will generate, (pollutants that become dissolved and into solution in the water like high temperature) see exhibits, (composition or asphalt roof roads stores, restaurants, and 800 dwelling units put over clay and sand?) or reducing the amount of discharge that is known to contribute to damage to the ecosystem in the first place.

Business as usual will surely result in un-natural selection of and kill (Take) of endangered or threatened species, and cause threats to human health to people that want to recreate in the water. It has already been proven that Salmon timing is significantly altered by temperature change alone, and results in un-natural selection when the runs spawn either earlier or later, resulting in illegal loss of genetic diversity. See "Take" A Citizens guide to the 4D rule, Thomas Quinn University of Washington, Issue Paper no. 5 EPA. Attached.

Another writer explains that, many of the toxic chemicals contained in runoff is persistent (does not break down easily) and bioaccumulate at harmful levels. He explains that these toxins (PBTs) include; heavy metals, PAHs, phthalates and PCHs discharged from local jurisdictions. PBTs (Persistent Bio-accumulating Toxins) released at any concentration level are certainly harmful to Chinook salmon, and other organisms, because of their persistent and bioaccumulating characteristics and harmful effect. In the Puget Sound region PBTs have been found in mussels, sole, rockfish, Salmon, Chinook Salmon, seals, and Orca whales. See David LaLiberte, Liberte Environmental Associates Wilsonville Oregon. (attached) Other authors stress that Superfund sites are even more susceptible. Citizens will lose more of the expectation of confidence in the quality of our waters. The chemicals that will be in the water from development threaten the genetics of people as well. See summary FS and RI, EPA documents.

A decision of no environmental significance because of whatever is "appropriate" can not be made without actual consideration of the facts and circumstances and the procedural and substantive requirements of SEPA. See Sisley v. San Juan County 89 Wn. 2d 78. SEPA is a

full disclosure and consideration environmental law. *Norway Hill Preservation and Protection Association v. King County* 87 Wn.2d 267, 552 P.2d 674.

It is evidently hoped we will overlook the fact that disclosure of pollutants that go into solution with the water as a direct result of the speculative development are not removed by the so called "treatment" and the only appeal left will be of the code decision and no one will be notified when that will take place. There is a 14 day appeal period with no required notice for those other stages. Other alternatives for review could consist of a Federal case. SEGB is not planning on overlooking the quality of our environment or the quality of the adequacy decision.

The thoughtful and realistic contemplation SEGB performs recognizes that Orca, Salmon, and many other species are at the brink of extinction, and our water quality is crucial and very important to our way of life, and more effective mitigation alternatives are needing to be carefully looked at. That our wildlife is a part of our lives and heritage.... Our Salmon and quality of water play a vital role for wildlife and people in our City and region. The health of our children and people that recreate with the Lake is at risk. See EPA synopsis.

Evidently the contract and presumptive plans were made simultaneously speculating that the 455,000 gallons of toxic PAH, (Polycyclic aromatic Hydrocarbons) BTEX, (Benzene Tolulene Ethylene Xylene) and DNAPL (Dense non Aqueous Phase Liquids) creosote and wood preservative chemicals already existing in the site would be merely covered over with organic clay or sand, expecting them to stay put instead of being removed from the site. There are Di-benzo Furans in the PAH, considered to be one of the dirty dozen. Pentaclorophenol? Arsenic?

SEGB expects the EPA process performed under CERCLA will remove the chemicals from the site entirely because of the threat they pose to human and animal health. SEGB has not been given an opportunity to comment on the ROD or PP yet. Techniques that could be used on the site that will still allow the development to proceed and would consider these facts may be implemented. We at SEGB are planning to participate.

But when the above happens and reviews are illegally scattered, segmented, and so incomplete and so slow, it probably would be that nobody can even figure out, remember, or pinpoint how all of the toxic compounds and pollution get into our water in the first place-there is no absolute precision, and it becomes much more expensive than it would be if considered in the beginning and with the single review contemplated by SEPA.

#### **STANDING**

Standing is affirmed by the harm that would be caused by the numerous harmful wastes that would be discharged and eventually end up in Lake Washington and Puget Sound, adversely impacting and harming our members and myself, or for that matter the entire City and State's enjoyment and quality of life, present and future generations included, if information is not included on the alternatives and measures put in place to mitigate impacts. We have already suffered harm from the lack of a site configuration because we can't comment based upon true

information or on our interest in such other activities as the availability and enjoyment of Fishing and wildlife. Brad Nicholson and SEGB enjoy high environmental expectations and enjoyment of wildlife and recreation such as boating, swimming, and fishing in and around Lake Washington in this area and this security and these activities would be lost and risk to our health would be added if this decision is not reversed and environmental amenities protected. Brad Nicholson is a member of SEGB. We do recognize that the difficulty of articulating some harms that will be caused by the project are difficult to articulate, because the site is not defined and the results of the Superfund cleanup are incomplete. We must presume the site and water is in its original natural state for purposes of reviewing impacts, degradation, and standing. The proposal or the FEIS has no water quality improvements.

We at SEGB recognize that each person has a fundamental and inalienable right to a safe, enjoyable, and healthful environment RCW 43.21C.020 (3) and, each person has a fundamental responsibility to preserve and enhance that right. Without a decision in favor of this appeal, the ability of SEGB to preserve and enhance our environment will be damaged. See also RCW 70.105D.010(1)(2)(4)(5)(6). We at SEGB contend that our concerns place us within the purview of being "arguably within SEPA's purpose" and that we will be adversely impacted and suffer actual harm if something is not done to reverse this decision. Those are the requirements for standing.

The ERC did not resolve to undertake to utilize "all practical means consistent with other essential considerations of State policy" to "fulfill the responsibility of each generation as trustee to the environment, nor did they "improve the plans, functions, programs, and resources, so that we may attain the widest range of beneficial uses without degradation, (emphasis supplied) or assure "safe and healthful, (emphasis supplied) productive surroundings, preserve natural aspects of our heritage, "enhance the quality of life RCW 43.21C.020(2)(a)(b)(c)(d)(e)(f)(g)

The difficulty obviously originates and arises from the differing objectives of different interests and the fundamental lack of coherence in the EIS description of objectives pertaining to water quality. The water quality objectives have been framed way too narrowly and been given so little attention that it has resulted in one alternative emerging that could make the FEIS merely a formality that does not accomplish what an EIS is supposed to accomplish.

We at SEGB believe that proponent fundamental beliefs must object to preparation of the statement in the first place. We represent opposing views that have standing and incorporating information like our contentions would carry out SEPA's purpose. The extent of impacts and quality of our Environment depend fundamentally on the clear and

coherent goals and compliance being outlined in the documents because they are what are supposed result in information that is to be used to make future planning and engineering decisions, where decision makers carry out SEPA substantial requirements. Instead of being a local success story the message of toxic runoff could prevail without SEGB. We contend the FEIS should be at the vanguard of effective solutions to curb toxic runoff. Clean water advocates across the Region and the Country will look at our work as stepping stones toward efforts to strengthen clean water policy and launch cost-effective and practical low-impact development projects.

## The proposal is inconsistent with SEPA because it does not discuss reasonable alternative mitigation such as LID or even consider the successes achieved in other jurisdictions, proving the FEIS is deficient

SEPA, see RCW 43.21C.030(c)(i)(ii)(iii) requires that reasonable alternatives be discussed in the EIS. "Reasonable alternative" is defined by SEPA rule, see WAC 197-11-786 "Reasonable alternative" means an action that could feasibly attain or approximate a proposal's objectives, but at a lower environmental cost or decreased level of environmental degradation. This is exactly what LID and other cases have been engineered to accomplish, that is, to improve and protect water quality by lowering the quantity of runoff and/or amount of pollution entering the environment using LID techniques. The technology that could be incorporated into the document is readily available in any location. Further, "Reasonable alternatives may be those over which an agency with jurisdiction has authority to control impacts, either directly, or indirectly through requirement of mitigation measures. (See WAC 197-11-440(5) and 197-11-660.id) They could still build their project and protect the water at the same time.

## <u>Discussion of relative scientific parameters of significant environmental concern for this type of project is not evident in the adequacy decision.</u>

This project is very large and polluted and actual review of cleanup plans has yet to take place. It has been described as one of the largest parcels on the shores of Lake Washington. They visualize up to 800 residential units, 30,000 sq ft. of retail commercial development, and 2,171 parking spaces on the Shore of Lake Washington, and three outfalls discharging to the Lake and Puget Sound. Without any alternative mitigation, some more disclosure must take place. Concerns with superfund re-use determination have not been decided and/or remedial actions are unperformed and unreviewed, all with no mitigation of the high pollution concentrations that would be encountered, no mention of the large volume of debris and solids that would be discharged, certain inappropriate discharges that will take place etc., or the microorganisms, toxicants, nutrients, or organic debris, and high heat elevated temperature that will be discharged, See Urban Stormwater Management in the United States, National Academy of Science pp. 180 Table 3.3. attached. Also see, Scientific Investigations Report 2012–5068, U.S. Department of the Interior U.S. Geological Survey, Contaminant Concentrations in Stormwater Runoff Synopsis pp.40, Control of toxic Chemicals in Puget Sound Ecology Publication No.11-03-010. The temperature increase from roofs and other pollution is directly linked to "Take"

Most if not all of the local educational material about storm water pollution express the same concerns and indicate this science is widely accepted. See exhibits.

Here, the EIS concludes the review is adequate only reviewing "Earth" and does not disclose or discuss or disclose the water pollution environmental concerns. Again the documents erroneously dismiss the concerns; SEPA is a full disclosure and consideration environmental law. *Norway Hill* Preservation and Protection Association v. King County 87 Wn.2d 267, 552 P.2d 674.

## Even though the single proposal is inconsistent with Washington's anti-degradation statute RCW 90.54.020 there is no indication that an attempt will be made to obtain the required exception or disclose the facts.

Substantial information would be required for a SSDP (Shoreline substantial development permit) that requires no degradation of the shoreline from the baseline or natural condition of the shoreline. The impacts are "significant" There is no way that anyone can state that three untreated straight pipes will not degrade the water and shoreline beaches on the site or nearby. We should be getting some idea of how to comply with all of the State or Federal requirements through information in in the document as opposed to just a philosophy, which is incontrovertibly much less protective of the environment. They presume to be able to violate Laws at will. Our fundamental requirements have not been considered in the document that dictate that "high quality waters" are necessary, that no degradation may occur, and that all known and reasonable treatment methods (AKART) must be utilized according to RCW 90.54.020(3)(b) see Washington Law 5510411. *Pollution control Hearings Board*. http://www.ecy.wa.gov/programs/wq/stormwater/municipal/LID/S4SJOrderHighlights.pdf

# The FEIS is premature and piecemeal because there has been no "Site Wide Ready for Anticipated Re-Use" or PP or ROD, operating to foreclose the disclosure and consideration process and divide the project into illegal segments

Among other things, in addition to the facts discussed above, the FEIS discloses that SMA (Shoreline Management Act) shoreline permits, master planning and site planning, and subdivision of land into 7 parcels to create the 800 residential dwelling units, retail and restaurant components, 2,171 parking stalls will be required. The ROD and PP are incomplete processes. In *Merkel v. Port of Brownsville 8 Wn. App. 844, 509 P.2d 390 (1973)* The size of the project and type of uses proposed were also significant. Piecemeal development results in damage to the natural environment. *Merkel*.

We contend that the EIS is fatally inadequate because it does not discuss the environmental relation to the Second Phase (which should be the first phase). The case here is that the cleanup should be done first before anything is built. We rely upon cases which hold that a series of interrelated steps constituting an integrated plan must be covered in a single impact statement. For example the *Trout* case was found to be inapposite to the rule, but that is not the situation here in the instant case. The distinction between these situations in which it has been held that the EIS must cover subsequent phases and that before us is that here the First Phase is not substantially independent of the Second while in those in which the EIS must extend beyond the current project, the project is dependent on subsequent phases. The

Page 12 of 13 September 24, 2015

dependency here is that it is such that it would be absolutely irrational to work on this place without the ROD or PP, or to undertake the first phase if the subsequent ROD phases were not also undertaken. They have it backwards. These arguments are confusing. We at SEGB take note that the error is zoning and FEIS is the first phase with the ROD being the second. That is precisely where the problem lies. The EPA must recognize that the cleanup has occurred regardless of whether the project will be built and not vise versa.

What's worse, is that the site has already been piecemealed, as the City zoned the SMA urban designation for the land based on whim, (they knew of all these problems but acted anyway to build administrative inertia) not even knowing the final condition of the land or its usability, and not providing opportunity for the public to comment on environmental consequences prior to the issuance of the ROD, or caring enough to have measures in place to protect against storm water pollution flowing off of the Superfund Site with straight pipes in the first place. They charge ahead and argue things as they come up, with the "Final" paradigm that could make appropriate review and consideration untimely. It can not be stated that no piecemealing will take place because it already has. The ERC determines that the EIS is adequate and "Final" without ever having had the procedural and systemic assistance of a cleaned up "baseline condition" or put another way the actual site configuration/ and/or consideration of special LID features that were originally requested in our comment letter (attached).

They have zoned the site for buildings that some say are bigger than the 737 assembly plant, and they don't even know the conditions of the Land before they begin considering. See conceptual photo exhibit. It is questionable whether any of the zoning was even legal. It was done to benefit the few rather than the City. Citizens have not commented on the ROD. One or all of the decisions are subject to a performance measure for re-use. See *Guidance for Documenting and Reporting the Superfund Sitewide Ready-for-Re-use Performance Measure*, OSWER 9365.0-36.

We at SEGB contend that the ROD measures need to be included in the document for the site and reviewed. Obviously it has not. The *Council on Environmental Quality* requires agencies to consider connected actions within a single document 40 CFR § 1508.25. Actions are connected, when (iii) Are interdependent parts of a larger action and depend on the larger action for their justification. 40 CFR § 1508.25 (a.) (1.)

In *Trout Unlimited v. Morton* 509 F. 2d 1276, 1285 the court found that an "<u>EIS must cover</u> a whole project when the dependency is such that it would be irrational or unwise to undertake the first phase if the second phase is not also undertaken" (emphasis suppled) Do they need to have an ROD......yes they do. Would it be unwise to just build and forget about the EPA and the ROD? Yes it would. The decision needs to be reversed.

The above case is dispositive. The decision is inconsistent with procedural rules that are clear that the information must be in the EIS (single document) prior to decisions or issuing permits where the project, (i) Cannot or will not proceed unless the other proposals (or parts of proposals) are implemented simultaneously with them; or (ii) Are interdependent parts of a larger proposal and depend on the larger proposal as their justification or for their implementation. See WAC 197-11-060 (3) (b)

Page 13 of 13 September 24, 2015

The requirement can only be satisfied by incorporating the ROD and the Site wide ready for reuse decision into the FEIS. Putting the EIS on hold and allowing another comment period after the ROD seems to be the only rational way to proceed. Citizens want to be confident that the CERCLA process will be carried out to its conclusion; right now only a feasibility study and investigation has taken place. The question posited is only whether it would be unwise not to undertake the CERCLA process. Thus the CERCLA ROD and PP information must be included in the FEIS.

An invalid decision is also indicated by the failure to follow other rules of procedure. See WAC 197-11-080(3)(a)(b) No worst case analysis has been performed. This is precisely the type of information that is required by SEGB and necessary for protection of environmental quality that we value. It is required by SEPA.

We advance our challenge to you noting the issues will turn on whether SEPA's procedures are followed. "The whole range of process requirements for EIS preparation and use are potential grounds for legal challenge" See R. Settle, **The Washington State Environmental Policy Act:** A Legal and Policy Analysis § 14 (a), at 149. This challenge should be evaluated under the "Rule of Reason" R. Settle, at 154. Further citation may follow.

An Exhibit List is attached.

Thankyou in advance for your thoughtful consideration,

Brad Nicholson, and SEGB, Brad Nicholson President

Malleun 9-24-15

#### **EXHIBITS**

- 1. Water quality Page Department of ecology
- 2. FEIS Notice
- 3. Site description EPA
- 4. Wiki encyclopedia "Creosote"
- 5. conceptual photo
- 6. Focus on Puget Sound May 2011
- 7. Resolution no. 3761
- 8. Science of Stormwater King County
- 9. LID manual section 6.4 vegetated roofs
- 10. Map-Distribution of Chinook Salmon
- 11. Proponent web page
- 12. Publication No. 11-03-010
- 13. Roofing material abstract ASCE Sept/Oct 2008
- 14. Radke memorandum
- 15. 17 September 2012 agenda bill
- 16. addendum notice
- 17. Summary WRIA 8 strategy
- 18. Notice of significance
- 19. EPA issue paper no. 5
- 20. WL 5510411 (2008)
- 21. Temperature abstract Thomas Quinn U of W
- 22. Relative sources of concern pp.180 USM in the United States
- 23. EPA-841-F-03-003
- 24. EPA-560-F-07-231
- 25. EPA-560-F-07-232
- 26. USGS Scientific Investigations report 2012-5068
- 27. EPA OSWER 9365.0-36
- 28. SEGB comment letter
- 29. Sightline abstract March 2011
- 30. EPA OSWER 9365.0-30
- 31. Executive summary RI report
- 32. EPA 560-F-06-244
- 33. Ecology publication #07-10-058
- 34. Renton letter dated Feb 3, 2012
- 35. EPA letter 13 Jan. 2011
- 36. EIS addendum
- 37. EPA executive summary
- 38. Blumen contract



## NOTICE OF ISSUANCE & AVAILABILITY FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS) AND MITIGATION DOCUMENT

Notice is given under SEPA, RCW 43.21C.080, that the Final Environmental Impact Statement (FEIS) for the proposal described below was issued by the City of Renton Environmental Review Committee on Monday, August 31, 2015, and is available for public review. In addition, Notice is hereby given that the City of Renton Environmental Review Committee has issued a Mitigation Document for the proposal describe below on Monday, August 31, 2015 pursuant to WAC 197-11-660 and RMC 4-9-070, and is available for public review. The FEIS and Mitigation Document are available for review at the Renton Main Library, located at 100 Mill Avenue South, and the Renton Highlands Branch Library, located at 2902 NE 12th Street, at Renton City Hall, Customer Service Counter, 6th floor, 1055 South Grady Way, Renton WA 98057, and on the City of Renton web site: (www.rentonwa.gov).

**PROPOSAL:** The Quendall Terminals proposal is located adjacent to Lake Washington on 21.46 acres of Commercial/Office/Residential (COR) zoned property. The EIS evaluates potential impacts resulting from a mixed-use development project, including four Alternatives, including a no action alternative. The Preferred Alternative would contain 21,600 square feet of retail space, 9,000 square feet of restaurant and 692 residential units.

PROJECT NUMBER:

LUA09-151, EIS, ECF, BSP, SA-M, SM

**PROJECT NAME:** 

**Quendall Terminals** 

**PROPONENT:** 

Campbell Mathewson, Century Pacific, L. P., 1201 Third

Ave., Suite 1680; Seattle, WA 98101

**LOCATION:** 

4350 Lake Washington Blvd

FOR FURTHER INFORMATION, PLEASE CONTACT THE PROJECT MANAGER VANESSA DOLBEE AT (425) 430-7314.

DO NOT REMOVE THIS NOTICE WITHOUT PROPER AUTHORIZATION

PLEASE INCLUDE THE PROJECT NUMBER WHEN CALLING FOR PROPER FILE IDENTIFICATION.



LEAD AGENCY: City of Renton, Environmental Review Committee, Department

of Community & Economic Development, Planning Division

RESPONSIBLE OFFICAL: Environmental Review Committee, Department of Community

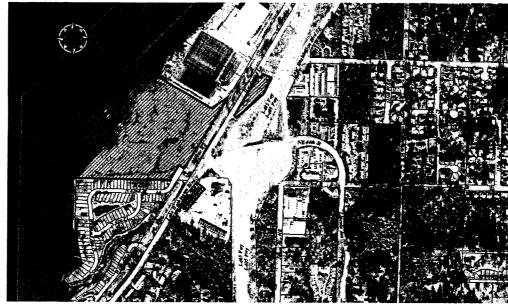
& Economic Development, Planning Division, 1055 S Grady Way,

Renton, WA 98057

**DOCUMENT PURCHASE INFORMATION:** The Final Environmental Impact Statement and Mitigation Document is available for purchase from the Finance Department on the 1st Floor of Renton City Hall. The FEIS is \$35 and the Mitigation Document is \$7.50 per hard copy or \$10.00 per CD of the FEIS, plus tax and postage (if mailed).

**PUBLIC REVIEW:** The impacts described in the Quendall Terminals DEIS and EIS Addendum are the basis for the mitigation measures established in the Mitigation Document. The Mitigation Document is designated by the City of Renton as the first decision document for the proposal.

APPEAL PROCESS: Upon issuance of the FEIS and Mitigation Document, a twenty (20) day appeal period commences. Pursuant to WAC 197-11-680 and RMC 4-8-110.E., the adequacy of the Final EIS and the Mitigation Document may be appealed. Appeals must: 1) state specific objections of fact and/or law; 2) be submitted in writing by 5:00 p.m. September 24, 2015; and 3) be accompanied by a filing fee of \$250.00. Appeals must be addressed to Phil Olbrechts, Hearing Examiner, City of Renton, Renton City Hall, 1055 S Grady Way, Renton, WA 98055.



FOR FURTHER INFORMATION, PLEASE CONTACT THE PROJECT MANAGER VANESSA DOLBEE AT (425) 430-7314.

DO NOT REMOVE THIS NOTICE WITHOUT PROPER AUTHORIZATION

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Water Quality > Stormwater

#### **Stormwater**

Stormwater is rain and snow melt that runs off surfaces such as rooftops, paved streets, highways, and parking lots. As water runs off these surfaces, it can pick up pollution such as: oil, fertilizers, pesticides, soil, trash, and animal waste. From here, the water might flow directly into a local stream, bay, or lake. Or, it may go into a storm drain and continue through storm pipes until it is released **untreated** into a local waterway.

In addition, the large impervious surfaces in urban areas increase the quantity of peak flows of runoff, which in turn cause hydrologic impacts such as scoured streambeds channels, instream sedimentation and loss of habitat. Furthermore, because of the volume of runoff discharges, mass loads of pollutants in stormwater can be significant.

**Human Health**: In general, untreated stormwater is unsafe. It can contain toxic metals, organic compounds, bacteria, and viruses. Untreated stormwater is not safe for people to drink and is not recommended for swimming. Polluted stormwater can lead to beach closures for swimming and shellfish harvesting. It can also trigger toxic algal blooms.



**Drinking Water**: In some areas of Washington, notably Spokane County, and parts of Pierce and Clark counties, gravelly soils allow rapid infiltration of stormwater. Untreated stormwater discharging to the ground could contaminate aquifers that are used for drinking water.

**Degraded Water Quality**: Virtually all of our urban creeks, streams, and rivers are harmed by stormwater

pollution. Stormwater is the leading contributor to water quality pollution of urban waterways in Washington.



Impaired Habitat: In Washington, urban stormwater harms and pollutes streams that provide habitat for fish and wildlife. Alterations to the watershed, such as building homes and other structures and clearing away trees and shrubs, are the leading causes for stormwater pollution. Federal agencies identified habitat loss from stormwater runoff as one of the primary obstacles to salmon recovery. (See more about regulating flows to protect habitat.)

#### **Permits**

- Construction Stormwater General Permit
- Industrial Stormwater General Permit
  - O No-Exposure Online Form (Industrial Stormwater Permit only)
- Municipal Stormwater Permits (Phase I and II)
- Sand and Gravel General Permit
- Washington State Department of Transportation Municipal Stormwater General Permit



**WAWebDI** 

Washingto Stormwat

How To Do Stormwat

- A Guide
Industrial

Stormwat Monitoring

Certified I
Sediment
(CESCL) and Certif
Programs

How Is St Regulated

# QUENDALL TERMINAL WASHINGTON EPA ID# WAD980639215

EPA Region 10
King
Renton

8th Congressional District Other Names:

Last Update: November, 2009

## -Site Description

The Quendall Terminals Superfund Site is located on the southeastern shore of Lake Washington, in Renton, Washington. The site is a former creosote manufacturing facility and has been contaminated with coal tar, pitch, creosote, and other hazardous chemicals.

Altino Properties and J. H. Baxter & Company, two of the site's Responsible Parties, have begun a remedial investigation/feasibility study (RI/FS) to better understand the contamination and develop a cleanup plan. The study includes sampling of soils, groundwater, and lake sediment along the shoreline of the site. EPA expects to review the sampling results, complete the RI/FS and select a cleanup plan in about three years. Earlier sampling showed that contamination at Quendall Terminals could pose a risk to people and the environment.

The facility began operating in 1917 as the Republic Creosoting Company, which became Reilly Tar and Chemical Corporation in 1956. Creosote was manufactured onsite for about 53 years until 1969. This creosote manufacturing facility refined and processed coal tar and oil-gas tar residues. The tars were purchased from the Seattle Gas Company on Lake Union and were shipped or barged to the site. The tars consisted of polyaromatic hydrocarbon (PAH) compounds, phenolic compounds, light aromatic compounds (including benzene, toluene, and xylenes) and other organic compounds. At the facility, tar distillates were refined to creosote and other chemical products. Releases of tars and creosote products to the environment occurred in portions of the site where the transport, production and/or storage of the products were performed. In 1971, the site was sold to Quendall Terminals. Between 1969 and 1978, the site was used intermittently to store diesel, crude and waste oils. Since 1977, the site has been used as a log sorting and storage yard.

Site Responsibility: This site is being addressed through an administrative order on consent with two potentially responsible parties (PRPs).

NPL Listing History	Dates
Proposed Date:	09/14/2005
Removed Date:	

Withdrawal Date:	
Final Date:	04/19/2006
Deleted Date:	

## -Threats and Contaminants

#### **Media Affected:**

The primary contaminants of concern are carcinogenic PAHs and benzene. These contaminants are found in the soil and ground water throughout the site. These compounds are found at concentrations well above State cleanup levels for residential and industrial sites. At some locations on the site, creosote product has been found under the surface. In some areas the product is four to six feet thick. Releases of these contaminants to Lake Washington are of particular concern.

Lake Washington is used for a variety of recreational purposes including fishing and swimming. The southern end of Lake Washington, including the area where the site is located, is considered prime habitat for rearing of juvenile Chinook, which is a Federal Threatened Species, and other salmon stocks. The Cedar River, which enters Lake Washington approximately two miles from the site, supports the largest sockeye run in the contiguous United States. Lake Washington also supports several sensitive environments including habitat for bull trout and the bald eagle. In addition, there are two swimming beaches located within one half mile of the site.

## -Cleanup Progress

Until 2006, the Washington State Department of Ecology (Ecology) was the lead regulatory agency for overseeing the cleanup. A Remedial Investigation report and a draft Risk Assessment/Focused Feasibility Study were completed by Quendall under oversight by Ecology. No removal actions have taken place to date. In May 2005, Ecology requested EPA take the lead for overseeing the cleanup at the site. EPA assumed the role of lead agency at that time and in 2006 the site was added to EPA's Superfund National Priorities List. In September 2006, Altino Properties and J. H. Baxter & Company, two of the site's Responsible Parties, entered into an Administrative Order on Consent (AOC) with EPA. The AOC requires the Responsible Parties to complete a remedial investigation and feasibility study (RI/FS). Based on the RI/FS EPA will propose a preferred cleanup remedy, and after seeking public comment will select a final cleanup remedy. The Responsible Parties have collected additional data during July through October 2009. That data will be used to fill data gaps identified during the review of historic site data. EPA expects that the RI/FS will be completed by December 2010.

## -Regional Contacts

**SITE MANAGER(S):** 

Lynda Priddy

**E-MAIL ADDRESS:** 

priddy.lynda@epa.gov

**PHONE NUMBER:** 

206-553-1987

**COMMUNITY INVOLVEMENT** 

Suzanne Skadowski

COORDINATOR:

E-MAIL ADDRESS PHONE NUMBER:

skadowski.suzanne@epa.gov

206-553-6689

Information pertaining to this site is housed at the following location(s):

EPA Quendall Terminals webpage:

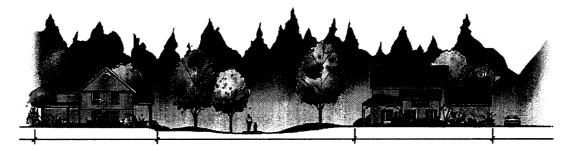
http://yosemite.epa.gov/R10/CLEANUP.NSF/sites/quendall

EPA Region 10 Records Center 1200 6th Ave, Ste 900 Seattle, WA 98101

Call for appointment: 206-553-4494

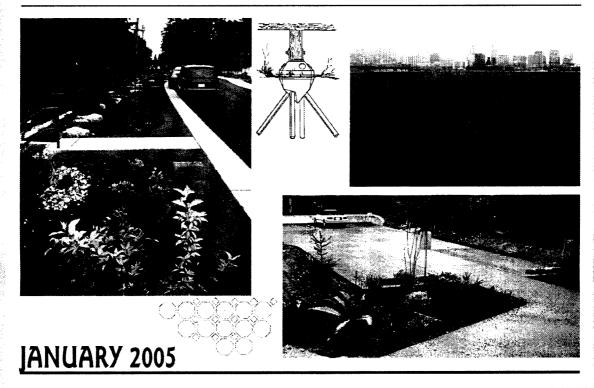
Renton Public Library 100 Mill Ave South Renton, WA 98057

Call ahead for hours: 425-430-6610



# LOW IMPACT DEVELOPMENT

TECHNICAL GUIDANCE MANUAL FOR PUGET SOUND



Puget Sound Action Team • Washington State University Pierce County Extension

## Integrating LID into Local Codes:

# A GUIDEBOOK FOR LOCAL GOVERNMENTS

Final July 2012

Prepared by AHBL for the Puget Sound Partnership













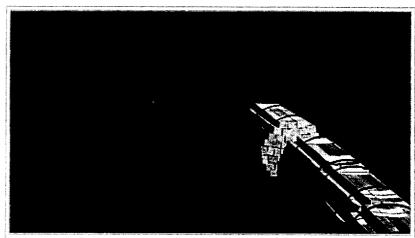


### **Creosote**

From Wikipedia, the free encyclopedia

For other uses, see Creosote (disambiguation).

Creosotes are a category of carbonaceous chemicals formed by the distillation of various tars, and by pyrolysis of plant-derived material, such as wood or fossil fuel. They are typically used as preservatives or antiseptics.<sup>[2]</sup> Some creosote types were used historically as a treatment for components of seagoing and outdoor wood structures to prevent rot (e.g., railroad ties and bridgework, see image). Samples may be commonly found inside chimney flues where the wood or coal burns under variable conditions, producing soot and tarry smoke. Creosotes are the principal chemicals responsible for the stability, scent, and flavor which is characteristic of smoked meat; the name is derived from the Greek kréas (κρέας),



Railcar-loads of wood railroad ties before and after impregnation with creosote, at a facility of the Santa Fe Railroad, in Albuquerque, New Mexico, in March 1943. This U.S. wartime governmental photo reports that "The steaming black ties in the [left of photo]... have just come from the retort where they have been impregnated with creosote for eight hours." Ties are "made of pine and fir... seasoned for eight months" [as seen in the untreated railcar load at right]. [1]

meaning "meat", and  $s\bar{o}t\bar{e}r$  (σωτήρ), meaning "preserver".[3]

The two main kinds recognized in industry are **wood-tar creosote** and **coal-tar creosote**. The coal-tar variety, having stronger and more toxic properties, has chiefly been used as a preservative for wood, while the wood-tar variety has been used for meat preservation, ship treatment, and for medical purposes as an expectorant, antiseptic, astringent, anaesthetic, and laxative, though these have mostly been replaced by modern medicines. Coal-tar creosote was formerly used as an escharotic to burn malignant skin tissue and in dentistry to prevent necrosis before its carcinogenic properties became known. Varieties of creosote have also been made from both petroleum and oil shale and are known as **oil-tar creosote** when derived from oil tar and **water-gas-tar creosote** when derived from the tar of water gas. Creosote also has been made from pre-coal formations such as lignite, yielding **lignite-tar creosote**, and peat, yielding **peat-tar creosote**.

#### **Contents**

- 1 Creosote oils
  - 1.1 Wood-tar creosote
    - 1.1.1 Historical uses
      - 1.1.1.1 Industrial

- 1.1.1.2 Medical
- 1.1.2 Current uses
  - 1.1.2.1 Industrial
  - 1.1.2.2 Medical
- 1.2 Coal-tar creosote
  - 1.2.1 Historical uses
    - 1.2.1.1 Industrial
    - 1.2.1.2 Medical
  - 1.2.2 Current uses
    - 1.2.2.1 Industrial
  - 1.2.3 Health effects
- 1.3 Oil-tar creosote
- 1.4 Water-gas-tar creosote
- 1.5 Lignite-tar creosote
- 1.6 Peat-tar creosote
- 2 Build-up in chimneys
- 3 See also
- 4 Notes
- 5 References
- 6 External links

#### Creosote oils

For some part of their history, wood-tar creosote, and coal-tar creosote were suggested to be the same substance—only of distinct origins—accounting for their common name; the two were determined only later to be chemically different substances. All types of creosote are composed of phenol derivatives and share some quantity of monosubstituted phenols, but these are not the only active element of creosote. For its useful effect, wood-tar creosote relies on the presence of methyl ethers of phenol, and coal-tar creosote on the presence of naphthalenes and anthracenes; otherwise either type of tar would dissolve in water.

Creosote was first discovered in its wood-tar form in 1832 by Carl Reichenbach, when he found it both in the tar and in pyroligneous acids obtained by a dry distillation of beechwood. Because pyroligneous acid was known as an antiseptic and meat preservative, Reichenbach did experiments with dipping meat in a dilute solution of distilled creosote. He found that the meat was dried without undergoing putrefaction and had attained a smoky flavor. <sup>[5]</sup> This led him to reason that creosote was the antiseptic component contained in smoke, and he further argued that the creosote he had found in wood tar was also in coal tar, animal tar, and amber tar in the same abundance as in wood tar. <sup>[3]</sup>

Soon after, in 1834, Friedrich Ferdinand Runge discovered carbolic acid in coal-tar, and Auguste Laurence obtained it from phenylhydrate, which was soon determined to be the same compound. There was no clear view on the relationship between carbolic acid and creosote; Runge described it as having similar caustic and antiseptic properties, but noted that it was different, in that it was an acid and formed salts. Nonetheless, Reichenbach argued that creosote was also the active element, as it was in

pyroligneous acid. Despite evidence to the contrary, his view held sway with most chemists, and it became commonly accepted wisdom that creosote, carbolic acid, and phenylhydrate were identical substances, with different degrees of purity.<sup>[3]</sup>

Carbolic acid was soon commonly sold under the name "creosote", and the scarcity of wood-tar creosote in some places led chemists to believe that it was the same substance as described by Reichenbach. In the 1840s, Eugen Freiherr von Gorup-Besanez after realizing that two samples of substances labeled as creosote were different, started a series of investigations to determine the chemical nature of carbolic acid, leading to a conclusion that it more resembled chlorinated quinones and must have been a different, entirely unrelated substance. Independently, there were investigations into the chemical nature of creosote. A study by F.K. Völkel revealed that the smell of purified creosote resembled that of guaiacol, and later studies by Heinrich Hlasiwetz identified a substance common to guaiacum and creosote that he called creosol and determined that creosote contained a mixture of creosol and guaiacol. Later investigations by Gorup-Besanez, A.E. Hoffmann and Siegfried Marasse showed that wood-tar creosote also contained phenols, giving it a feature in common with coal-tar creosote. [6]

Historically, coal-tar creosote has been distinguished from what was thought of as creosote proper—the original substance of Reichenbach's discovery—and referred to specifically as "creosote oil". But because creosote from coal-tar and wood-tar are obtained from a similar process and have some common uses, they have also been placed in the same class of substances, with the terms "creosote" or "creosote oil" referring to either product.<sup>[2]</sup>

#### Wood-tar creosote

The term creosote has a broad range of definitions depending on the origin of the coal tar oil and end use of the material. With respect to wood preservatives the United States Environmental Protection Agency (EPA) considers the term creosote to mean that it is a pesticide for use as a wood preservative meeting the

Constituency of distill different temperatures		osote from o	lifferent wo	ods at
	Be	ech	Oak	Pine
<b>°</b> C	200-220	200-210	200210	200-210
Monophenols	39.0 %	39.0 %	55.0 %	40.0%
Guaiacol	19.7 %	26.5 %	14.0 %	20.3%
Creosol and homologs	40.0%	32.1%	31.0%	37.5%
Loss	1.3%	2.4%		2.2%

American Wood Protection Association (AWPA) Standards P1/P13 and P2.<sup>[10]</sup> The AWPA Standards require that creosote "shall be a pure coal tar product derived entirely from tar produced by the carbonization of bituminous coal." <sup>[11][12]</sup> Currently all creosote treated wood products—railroad crossties, utility poles, foundation and marine piling, posts, lumber, and timbers—are manufactured using this type of wood preservative. The manufacturing process can only be a pressure process under the supervision of a licensed applicator certified by the State Departments of Agriculture. No brush-on, spray or non-pressure uses of creosote are allowed as specified by the EPA approved label for the use of creosote. <sup>[13]</sup> The use of creosote according to the AWPA Standards does not allow for mixing with other types of "creosote type" materials—such as wood-tar creosote, lignite-tar creosote, peat-tar creosote, oil-tar creosote, and water-gas-tar creosote. The AWPA Standard P3 does however, allow blending of a high-boiling petroleum oil meeting the AWPA Standard P4. <sup>[12] [14]</sup>

The information that follows describing the other various types of creosote materials and its uses should be considered as primarily being of only historical value. This history is important, because it traces the origin of these different material used during the 19th and early 20th centuries. Further it must be considered that these other types of creosotes — lignite-tar, wood-tar, water-gas-tar, etc. — are not currently being manufactured and have either been replaced with more economical materials, or replaced by products that are more efficacious.

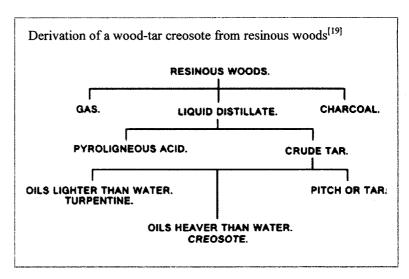
Wood-tar creosote is a colourless to yellowish greasy liquid with a smoky odor, produces a sooty flame when burned, and has a burned taste. It is non-buoyant in water, with a specific gravity of 1.037 to 1.087, retains fluidity at a very low temperature, and boils at 205-225 °C. When transparent, it is in its purest form. Dissolution in water requires up to 200 times the amount of water as the base creosote. [15] The creosote is a combination of natural phenols: primarily guaiacol and creosol (4-methylguaiacol), which will typically constitute 50% of the oil; second in prevalence, cresol and xylenol; the rest being a combination of monophenols and polyphenols.

Composition of a typic	cal beech-tar creosote <sup>[7][16]</sup>	
Phenol	C <sub>6</sub> H <sub>5</sub> OH	5.2%
o-cresol	$(CH_3)C_6H_4(OH)$	10.4%
m- and p-cresols	$(CH_3)C_6H_4(OH)$	11.6%
o-ethylphenol	$C_6H_4(C_2H_5)OH$	3.6%
Guaiacol	$C_6H_4(OH)(OCH_3)$	25.0%
1,3,4-xylenol	$C_6H_3(CH_3)_2OH$	2.0%
1,3,5-xylenol	$C_6H_3(CH_3)_2OH$	1.0%
Various phenols	C <sub>6</sub> H <sub>5</sub> OH—	6.2%
Creosol and homologs	$C_6H_3(CH_3)(OH)(OCH_3)$ —	35.0%

The simple phenols are not the only active element in wood-tar creosote. In solution, they coagulate albumin, which is a water-soluble protein found in meat; so they serve as a preserving agent, but also cause denaturation. Most of the phenols in the creosote are methoxy derivatives—they contain the methoxy group linked to the benzene nucleus (O–CH<sub>3</sub>). The high level of methyl derivates created from the action of heat on wood (also apparent in the methyl alcohol produced through distillation) make wood-tar creosote substantially different

from coal-tar creosote. Guaiacol is a methyl ether of pyrocatechin, while creosol is a methyl ether of methyl-pyrocatechin, the next homolog of pyrocatechin. Methyl ethers differ from simple phenols in being less hydrophilic, caustic and poisonous.<sup>[17]</sup> This allows meat to successfully be preserved without tissue denaturation, and allows creosote to be used as a medical ointment.<sup>[18]</sup>

Because wood-tar creosote is used for its guaiacol and creosol content, it is generally derived from beechwood rather than other woods, since it distills with a higher proportion of those chemicals to other phenolics. The creosote can be obtained by distilling the wood tar and treating the fraction heavier than water with a sodium hydroxide solution. The alkaline solution is then separated from the insoluble oily layer, boiled in contact with air to reduce impurities, and decomposed by diluted sulphuric acid.



This produces a crude creosote, which is purified by re-solution in alkali and re-precipitation with acid and then redistilled with the fraction passing over between 200° and 225° constituting the purified creosote.<sup>[20]</sup>

When ferric chloride is added to a dilute solution, it will turn green; a characteristic of ortho-oxy derivatives of benzene. [17] It dissolves in sulphuric acid to a red liquid, which slowly changes to purpleviolet. Shaken with hydrochloric acid in the absence of air, it becomes red, the color changing in the presence of air to dark brown or black. [18]

In preparation of food by smoking, guaiacol contributes mainly to the smoky taste, while the dimethyl ether of pyrogallol, syringol, is the main chemical responsible for the smoky aroma.

#### Historical uses

#### Industrial

Soon after it was discovered and recognized as the principle of meat smoking, wood-tar creosote became used as a replacement for the process. Several methods were used to apply the creosote. One was to dip the meat in pyroligneous acid or a water of diluted creosote, as Reichenbach did, or brush it over with them, and within one hour the meat would have the same quality of that of traditionally smoked preparations.<sup>[21]</sup> Sometimes the creosote was diluted in vinegar rather than water, as vinegar was also used as a preservative.<sup>[22]</sup> Another was to place the meat in a closed box, and place with it a few drops of creosote in a small bottle. Because of the volatility of the creosote, the atmosphere was filled with a vapor containing it, and it would cover the flesh.<sup>[21]</sup>

The application of wood tar to seagoing vessels was practiced through the 18th century and early 19th century, before the creosote was isolated as a compound. Wood-tar creosote was found not to be as effective in wood treatments, because it was harder to impregnate the creosote into the wood cells, but still experiments<sup>[23]</sup> were done, including by many governments, because it proved to be less expensive on the market.<sup>[24]</sup>

#### Medical

Even before creosote as a chemical compound was discovered, it was the chief active component of medicinal remedies in different cultures around the world.

Larrea tridentata, or the so-called creosote bush, as named after its distinct creosote smell, was used by Native Americans in the Southwest as a treatment for many maladies. The Coahuilla Indians used the plant for intestinal complaints and tuberculosis. The Pima drank a decoction of the leaves as an emetic, and applied the boiled leaves as poultices to wounds or sores. Papago Indians prepared it medicinally for stiff limbs, snake bites, and menstrual cramps. Guaiacum, after which the guaiacol in creosote was named, was used by native Caribbean islanders to treat tropical diseases and later for syphilis. [27][28]

In antiquity, pitches and resins were used commonly as medicines. Pliny mentions a variety of tar-like substances being used as medicine, including *cedria* and *pissinum*.<sup>[29]</sup> *Cedria* was the pitch and resin of the cedar tree, being equivalent to the oil of tar and pyroligneous acid which are used in the first stage of distilling creosote. [30][31] He recommends cedria to ease the pain in a toothache, as an injection in the ear in case of hardness of hearing, to kill parasitic worms, as a preventative for impregnation, as a treatment for phthiriasis and porrigo, as an antidote for the poison of the sea hare, as a liniment for elephantiasis, and as an ointment to treat ulcers both on the skin



and in the lungs.<sup>[31]</sup> He further speaks of cedria being used as the embalming agent for preparing mummies.<sup>[29]</sup> *Pissinum* was a tar water that was made by boiling cedria, spreading wool fleeces over the vessels to catch the steam, and then wringing them out.<sup>[32][33]</sup>



Portrait of Bishop Berkeley by John Smybert, 1727

The *Pharmacopeé of Lyons*, published in 1786, says that cedar tree oil can induce vomiting, and suggests it helps medicate tumors and ulcers. [34][35] Physicians contemporary to the discovery of creosote recommended ointments and pills made from tar or pitch to treat skin diseases. [34] Tar water had been used as a folk remedy since the Middle Ages to treat affections like dyspepsia. Bishop Berkeley wrote several works on the medical virtues of tar water, including a philosophical work in 1744 titled *Siris: a chain of philosophical reflexions and inquiries concerning the virtues of tar water, and divers other subjects connected together and arising one from another,* and a poem where he praised its virtues. [36] Pyroligneous acid was also used at the time in a medicinal water called *Aqua Binelli*. [34]

Given this history, and the antiseptic properties known to creosote, it became popular among physicians in the 19th century. A dilution of creosote in water was sold in pharmacies as *Aqua creosoti*, as suggested by the previous use of pyroligneous acid. It was prescribed to quell the irritability of the

stomach and bowels and detoxify, treat ulcers and abscesses, neutralize bad odors, and stimulate the mucous tissues of the mouth and throat. [37][38] Creosote in general was listed as an irritant, styptic, antiseptic, narcotic, and diuretic, and in small doses when taken internally as a sedative and anaesthetic. It was used to treat ulcers, and as a way to sterilize the tooth and deaden the pain in case of a tooth-ache. [37]

Creosote was suggested as a treatment for tuberculosis by Reichenbach as soon as 1833. Following Reichenbach, it was argued for by John Elliotson and Sir John Rose Cormack. [37] Elliotson, inspired by the use of creosote to arrest vomiting during an outbreak of cholera, suggested its use for tuberculosis through inhalation. He also suggested it for epilepsy, neuralgia, diabetes and chronic glanders. [39] The

idea of using it for tuberculosis failed to take hold, and use of this purpose was dropped, until the idea was revived later in 1876 by the British doctor G. Anderson Imlay, who suggested it be applied locally in spray to the bronchial mucous membrane. [37][40][41] This was followed up in 1877 when it was argued for in a clinical paper by Charles Bouchard and Henri Gimbert. [42] Germ theory had been established by Pasteur in 1860, and Bouchard, arguing that a bacillus was responsible for the disease, sought to rehabilitate creosote for its use as an antiseptic to treat it. He began a series of trials with Gimbert to convince the scientific community, and claimed a promising cure rate. [43] A number of publications in Germany confirmed his results in the following years.

Following that, that was a period of experimentation of different techniques and chemicals using creosote in tuberculosis, which lasted until about 1910, when radiation therapy looked to be a more promising treatment. Guaiacol, instead of a full creosote solution, was suggested by Hermann Sahli in 1887; he argued it had the active chemical of creosote and had the advantage of being of definite composition and of having a less unpleasant taste and odor. A number of solutions of both creosote and guaiacol appeared on the market, such as *phosphotal* and *guaicophosphal*, phosphites of creosote and guaiacol; *eosot* and *geosot*, valerinates of creosote and guaicol; *phosot* and *taphosot*, phosphate and tannophospate of creosote; and *creosotal* and *tanosal*, tannates of creosote. Creosote and eucalptus oil were also a remedy used together, administered through a vaporizor and inhaler. Since then, more effective and safer treatments for tuberculosis have been developed.

In the 1940s, Canadian-based Eldon Boyd experimented with guaiacol and a recent synthetic modification—glycerol guaiacolate (guaifenesin)—on animals. His data showed that both drugs were effective in increasing secretions into the airways in laboratory animals, when high enough doses were given.

#### Current uses

#### Industrial

Wood-tar creosote is to some extent used for wood preservation, but it is generally mixed with coal-tar creosote, since the former is not as effective. Commercially available preparations of "liquid smoke", marketed to add a smoked flavor to meat and aid as a preservative, consist primarily of creosote and other constituents of smoke. [46] Creosote is the ingredient that gives liquid smoke its function; guaicol lends to the taste and the creosote oils help act as the preservative.

#### Medical

The guaifenesin developed by Eldon Boyd is still commonly used today as an expectorant, sold over the counter, and usually taken by mouth to assist the bringing up of phlegm from the airways in acute respiratory tract infections. Guaifenesin is a component of Mucinex, Robitussin DAC, Cheratussin DAC, Robitussin AC, Cheratussin AC, Benylin, DayQuil Mucous Control, Meltus, and Bidex 400.

Seirogan is a popular Kampo medicine in Japan, used as an anti-diarrheal, and has 133 mg wood creosote from beech, pine, maple or oak wood per adult dose as its primary ingredient. Seirogan was first used as a gastrointestinal medication by the Imperial Japanese Army in Russia during the Russo-Japanese War of 1904-5. [47] Creomulsion is a cough medicine in the United States, introduced in 1925, that is still sold and contains beechwood creosote.

Creosote, in the form of samples from the creosote bush, is often found as a herbal remedy and supplement under the name *chaparral*, and in the form of beechwood creosote under the name *kreosotum* or *kreosote*.

#### Coal-tar creosote

The term creosote has a broad range of definitions depending on the origin of the coal tar oil and end use of the material. With respect to wood preservatives the United States Environmental Protection Agency (EPA) considers the term creosote to mean that it is a pesticide for use as a wood preservative meeting the American Wood Protection Association (AWPA) Standards P1/P13 and P2. (1) The AWPA Standards require that creosote "shall be a pure coal tar product derived entirely from tar produced by the carbonization of bituminous coal." (2) (3) Currently all creosote treated wood products—railroad crossties, utility poles, foundation and marine piling, posts, lumber, and timbers—are manufactured using this type of wood preservative. The manufacturing process can only be a pressure process under the supervision of a licensed applicator certified by the State Departments of Agriculture. No brush-on, spray or non-pressure uses of creosote are

Composition of a typical coal-tar creoso	te <sup>[48][49]</sup>
Aromatic hydrocarbons	
Polycyclic aromatic hydrocarbons (PAHs), alkylated PAHs, benzenes, toluenes, thylbenzenes, and xylenes (BTEX)	75.0–90.0%
Tar acids / phenolics	
Phenols, cresols, xylenols, and naphthols	5.0-17.0%
Far bases / nitrogen-containing heterocycle	es
Pyridines, quinolines, benzoquinolines, acridines, indolines, and carbazoles	3.0-8.0%
Sulfur-containing heterocycles	
Benzothiophenes	1.0-3.0%
Oxygen-containing heterocycles	
Dibenzofurans	1.0-3.0%
Aromatic amines	
Aniline, aminonaphthalenes, diphenyl amines aminofluorenes, and aminophenanthrenes, cyano-PAHs, benz acridines	0.1–1.0%

allowed as specified by the EPA approved label for the use of creosote. (2) The use of creosote according to the AWPA Standards does not allow for mixing with other types of "creosote type" materials—such as wood-tar creosote, lignite-tar creosote, peat-tar creosote, oil-tar creosote, and watergas-tar creosote. The AWPA Standard P3 does however, allow blend-ing of a high boiling petroleum oil meeting the AWPA Standard P4. (3) (4)

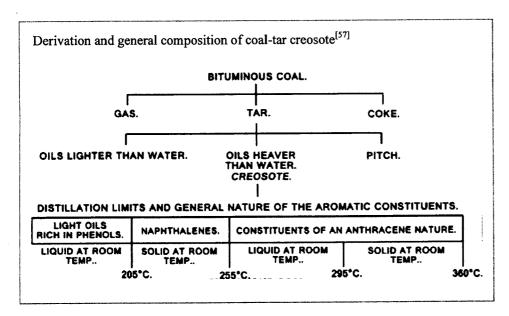
The information that follows describing the other various types of creosote materials and its uses should be considered as primarily being of only historical value. This history is important, because it traces the origin of these different material used during the 19th and early 20th centuries. Further it must be

considered that these other types of creosotes—lignite-tar, wood-tar, water-gas-tar, etc.—are not currently being manufactured and have either been replaced with more economical materials, or replaced by products that are more efficacious.

(1) Communication between United States Environmental Protection Agency (EPA) and the Creosote Council. (2) Reregistration Eligibility Decision Document for Creosote, United States Environmental Protection Agency 2008. (3) American Wood Protection Association Book of Standards 2013 (4) Preservative Treatment of Wood by Pressure Methods, United States Department of Agriculture, Forest Service, Handbook No. 40, 1952.

Coal-tar creosote is greenish-brown liquid, with different degrees of darkness, viscosity, and fluorescence depending on how it's made. When freshly made, the creosote is a yellow oil with a greenish cast and highly fluorescent; the fluorescence increased by exposure to air and light. After settling, the oil is dark green by reflected light and dark red by transmitted light. To the naked eye, it will generally appear brown. The creosote (often called "creosote oil") consists almost wholly of aromatic hydrocarbons, with some amount of bases and acids and other neutral oils. The flash point is 70–75 °C and burning point is 90–100 °C, and when burned it releases a greenish smoke. The smell largely depends on the naptha content in the creosote; if there is a high amount, it will have a naptha-like smell; otherwise it will smell more of tar.

In the process of coal-tar distillation, the distillate is collected into four fractions; the "light oil", which remains lighter than water, the "middle oil" which passes over when the light oil is removed; the "heavy oil", which sinks; and the "anthracene oil", which when cold is mostly solid and greasy, of a buttery consistence. Creosote refers to the portion of coal tar which distills as "heavy oil", typically between 230 –270 °C, also called "dead oil"; it sinks into water but still is fairly liquid. Carbolic acid is produced in the second fraction of distillation and is often distilled into what is referred to as "carbolic oil". [53][54][55]



Commercial creosote will contain substances from six groups. [48] The two groups occur in the greatest amounts and are the products of the distillation process—the "tar acids", which distill below 205 °C and consist mainly of phenols, cresols, and xylenols, including carbolic acid—and aromatic hydrocarbons, which divide into naphthalenes, which distill

approximately between 205° and 255 °C, and constituents of an anthracene nature, which distill above 255 °C. [58] The quantity of each varies based on the quality of tar and temperatures used, but generally, the tar acids won't exceed 5%, the naphthalenes will make up 15 to 50%, and the anthracenes will make

up 45% to 70%.<sup>[58]</sup> The hydrocarbons are mainly aromatic; derivatives of benzene and related cyclic compounds such as naphthalene, anthracene, phenanthrene, acenapthene, and fluorene. Creosotes from vertical-retort and low temperature tars contain, in addition, some paraffinic and olefinic hydrocarbons. The tar-acid content also depends on the source of the tar—it may be less than 3% in creosote from coke-oven tar and as high as 32% in creosote from vertical retort tar.<sup>[59]</sup> All of these have antiseptic properties. The tar acids are the strongest antiseptics but have the highest degree of solubility in water and are the most volatile; so, like with wood-tar creosote, phenols are not the most valued component, as by themselves they would lend to being poor preservatives.<sup>[60]</sup> In addition, creosote will contain several products naturally occurring in coal—nitrogen-containing heterocycles, such as acridines, carbazoles, and quinolines, referred to as the "tar bases" and generally make up about 3% of the creosote—sulfur-containing heterocycles, generally benzothiophenes<sup>[61]</sup>—and oxygen-containing heterocycles, dibenzofurans.<sup>[62]</sup> Lastly, creosote will contain a small number of aromatic amines produced by the other substances during the distillation process and likely resulting from a combination of thermolysis and hydrogenation.<sup>[63][64]</sup> The tar bases are often extracted by washing the creosote with aqueous mineral acid,<sup>[59]</sup> although they're also suggested to have antiseptic ability similar to the tar acids.

Commercially used creosote is often treated to extract the carbolic acid, naphthalene, or anthracene content. The carbolic acid or naphthalene is generally extracted to be used in other commercial products. 

[65] American produced creosote oils typically will have low amounts of anthracene and high amounts of naphthalene, because when forcing the distillate at a temperature that produces anthracene the soft pitch will be ruined and only the hard pitch will remain; this ruins it for use in roofing purposes, and only leaves a product which isn't commercially useful. 
[64]

#### Historical uses

#### Industrial

The use of coal-tar creosote on a commercial scale began in 1838, when a patent covering the use of creosote oil to treat timber was taken out by John Bethell. The "Bethell process"—or as it later became known, the full-cell process—involves placing wood to be treated in a sealed chamber and applying a vacuum to remove air and moisture from wood "cells". The wood is then pressure-treated to impregnate it with creosote or other preservative chemicals, after which vacuum is reapplied separate the excess treatment chemicals from the timber. Alongside the zinc chloride-based "Burnett process", use of creosoted wood prepared by the Bethell process became a principal way of preserving railway timbers (e.g., ties, sleepers) so wood rot and need for replacement could be avoided. [66]

Besides treating wood, it was also used for lighting and fuel. In the beginning, it was only used for lighting needed in harbor and outdoor work, where the smoke that was produced from burning it was of little inconvenience. By 1879, lamps had been created that ensured a more complete combustion by using compressed air, removing the drawback of the smoke. Creosote was also processed into gas and used for lighting that way. As a fuel, it was used to power ships at sea and blast furnaces for different industrial needs, once it was discovered to be more efficient than unrefined coal or wood. It was also used industrially for the softening of hard pitch, and burned produce lamp black. By 1890, the production of creosote in the United Kingdom totaled approximately 29,900,000 gallons per year. [52]

In 1854, Alexander McDougall and Angus Smith developed and patented a product called McDougall's Powder as a sewer deodorant; it was mainly composed from carbolic acid derived from creosote. McDougall, in 1864, experimented with his solution to remove entozoa parasites from cattle pasturing on a sewage farm. <sup>[67]</sup> This later led to widespread use of creosote as a cattle wash and sheep dip. External parasites would be killed in a creosote diluted dip, and drenching tubes would be used to administer doses to the animals stomach to kill internal parasites. <sup>[68]</sup>

Two later methods for creosoting wood were introduced after the turn of the century, referred to as empty-cell processes, because they involve compressing the air inside the wood so that the preservative can only coat the inner cell walls rather than saturating the interior cell voids. This is a less effective, though usually satisfactory, method of treating the wood, but is used because it requires less of the creosoting material. The first method, the "Rüping process" was patented in 1902, and the second, the "Lowry process" was patented in 1906. Later in 1906, the "Allardyce process" and "Card process" were patented to treat wood with a combination of both creosote and zinc chloride. [66] In 1912, it was estimated that a total of 150,000,000 gallons were produced in the United States per year.

#### Medical

Coal-tar creosote, despite its toxicity, was used as a stimulant and escharotic, as a caustic agent used to treat ulcers and malignancies and cauterize wounds and prevent infection and decay. It was particularly used in dentistry to destroy tissues and arrest necrosis. [69][70][71]

#### Current uses

#### Industrial

Coal-tar creosote is the most widely used wood treatment today; both industrially, processed into wood using pressure methods such as "full-cell process" or "empty-cell process", and more commonly applied to wood through brushing. In addition to toxicity to fungi, insects, and marine borers, it serves as a natural water repellant. It's commonly used to preserve and waterproof cross ties, pilings, telephone poles, power line poles, marine pilings, and fence posts. Although suitable for use in preserving the structural timbers of buildings, it is not generally used that way because it is difficult to apply.

Due to its carcinogenic character, the European Union has regulated the quality of creosote for the EU market <sup>[72]</sup> and requires that the sale of creosote be limited to professional users. <sup>[73][74]</sup> The United States Environmental Protection Agency regulates the use of coal tar creosote as a wood preservative under the provisions of the Federal Insecticide, Fungicide, and Rodenticide Act. Creosote is considered a restricted-use pesticide and is only available to licensed pesticide applicators <sup>[75][76]</sup>

#### Health effects

According to the Agency for Toxic Substances and Disease Registry (ATSDR), eating food or drinking water contaminated with high levels of coal tar creosote may cause a burning in the mouth and throat, and stomach pains. ATSDR also states that brief direct contact with large amounts of coal tar creosote may result in a rash or severe irritation of the skin, chemical burns of the surfaces of the eyes,

convulsions and mental confusion, kidney or liver problems, unconsciousness, and even death. Longer direct skin contact with low levels of creosote mixtures or their vapors can result in increased light sensitivity, damage to the cornea, and skin damage. Longer exposure to creosote vapors can cause irritation of the respiratory tract.

The International Agency for Research on Cancer (IARC) has determined that coal tar creosote is probably carcinogenic to humans, based on adequate animal evidence and limited human evidence. It is instructive to note that the animal testing relied upon by IARC involved the continuous application of creosote to the shaved skin of rodents. After weeks of creosote application, the animals developed cancerous skin lesions and in one test, lesions of the lung. The United States Environmental Protection Agency has stated that coal tar creosote is a probable human carcinogen based on both human and animal studies. As such, the Federal Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit of 0.2 milligrams of coal tar creosote per cubic meter of air (0.2 mg/m3) in the workplace during an 8-hour day, and the Environmental Protection Agency (EPA) requires that spills or accidental releases into the environment of one pound (0.454 kg) or more of creosote be reported to them.

There is no unique exposure pathway of children to creosote. Children exposed to creosote will probably experience the same health effects seen in adults exposed to creosote. It is unknown whether children differ from adults in their susceptibility to health effects from creosote.

A 2005 mortality study of creosote workers found no evidence supporting an increased risk of cancer death, as a result of exposure to creosote. Based on the findings of the largest mortality study to date of workers employed in creosote wood treating plants, there is no evidence that employment at creosote wood-treating plants or exposure to creosote-based preservatives was associated with any significant mortality increase from either site-specific cancers or non-malignant diseases. The study consisted of 2,179 employees at eleven plants in the United States where wood was treated with creosote preservatives. Some workers began work in the 1940s to 1950s. The observation period of the study covered 1979- 2001. The average length of employment was 12.5 years. One third of the study subjects were employed for over 15 years. [79]

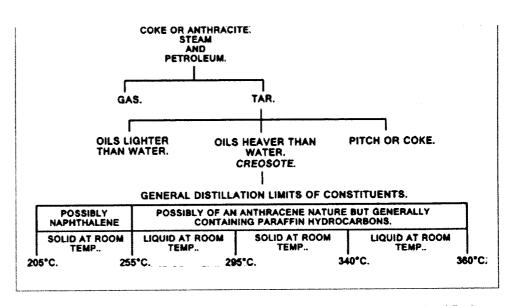
The largest health effect of creosote is deaths caused by residential chimney fires due to chimney tar (creosote) build-up. This is entirely unconnected with its industrial production or use.<sup>[80]</sup>

#### Oil-tar creosote

Oil-tar creosote is derived from the tar that forms when using petroleum or shale oil in the manufacturing of gas. The distillation of the tar from the oil occurs at very high temperatures; around 980 °C. The tar forms at the same time as

Derivation and general composition of water-gas-tar creosote<sup>[57]</sup>

the gas, and once processed for creosotes contains a high percentage of cyclic hydrocarbons, a very low amount of tar acids and tar bases, and no true anthracenes have been identified. [81] Historically, this has mainly been produced in the United States in the Pacific coast, where petroleum has been more abundant than coal.



Limited quantities have been used industrially, either alone, mixed with coal-tar creosote, or fortified with pentachlorophenol. [82]

#### Water-gas-tar creosote

Water-gas-tar creosote is also derived from petroleum oil or shale oil, but by a different process; its distilled during the production of water-gas. The tar is a by-product resulting from enrichment of water gas with gases produced by thermal decomposition of petroleum. Of the creosotes derived from oil, its practically the only one used for wood preservation. It has the same degree of solubility as coal-tar creosote and is easy to impregnate into wood. Like standard oil-tar creosote, it has a low amount of tar acids and tar bases, and has less antiseptic qualities. [57] Petri dish tests have shown that water-gas-tar creosote is one-sixth as anti-septically effective as that of coal-tar. [83]

#### Lignite-tar creosote

Lignite-tar creosote is produced from lignite rather than bituminous coal, and varies considerably from coal-tar creosote. Also called "lignite oil", it has a very high content of tar acids, and has been used to increase the tar acids in normal creosote when necessary.<sup>[84]</sup> When it has been produced, its generally been applied in mixtures with coal-tar creosote or petroleum. Its effectiveness when used alone has not been established. In an experiment with southern yellow pine fence posts in Mississippi, straight lignite-tar creosote was giving good results after about 27 years exposure, although not as good as the standard coal-tar creosote used in the same situation.<sup>[85]</sup>

#### Peat-tar creosote

There have also been attempts to distill creosote from peat-tar, although mostly unsuccessful due to the problems with winning and drying peat on an industrial scale. [86] Peat tar by itself has in the past been used as a wood preservative.

### **Build-up in chimneys**

Burning wood and fossil fuels at low temperature causes incomplete combustion of the oils in the wood, which are off-gassed as volatiles in the smoke. As the smoke rises through the chimney it cools, causing water, carbon, and volatiles to condense on the interior surfaces of the chimney flue. The black oily residue that builds up is referred to as creosote, which is similar in composition to the commercial products by the same name, but with a higher content of carbon black.

Over the course of a season creosote deposits can become several inches thick. This creates a compounding problem, because the creosote deposits reduce the draft (airflow through the chimney) which increases the probability that the wood fire is not getting enough air to burn at high temperature. Since creosote is highly combustible, a thick accumulation creates a fire hazard. If a hot fire is built in the stove or fireplace, and the air control left wide open, this may allow hot oxygen into the chimney where it comes in contact with the creosote which then ignites—causing a chimney fire. Chimney fires often spread to the main building because the chimney gets so hot that it ignites any combustible material in direct contact with it, such as wood. The fire can also spread to the main building from sparks emitting from the chimney and landing on combustible roof surfaces. In order to properly maintain chimneys and heaters that burn wood or carbon-based fuels, the creosote buildup must be removed. Chimney sweeps perform this service for a fee. [80]

73% of heating fires and 25% of all residential fires in the United States are caused by failure to clean out creosote buildup. Since 1990, creosote buildup has caused 75% fewer fires..<sup>[80]</sup> This is partly due to the use of efficient wood-burning stoves that fully combust the carbon from fuel.

#### See also

Pentachlorophenol

#### **Notes**

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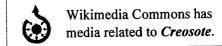
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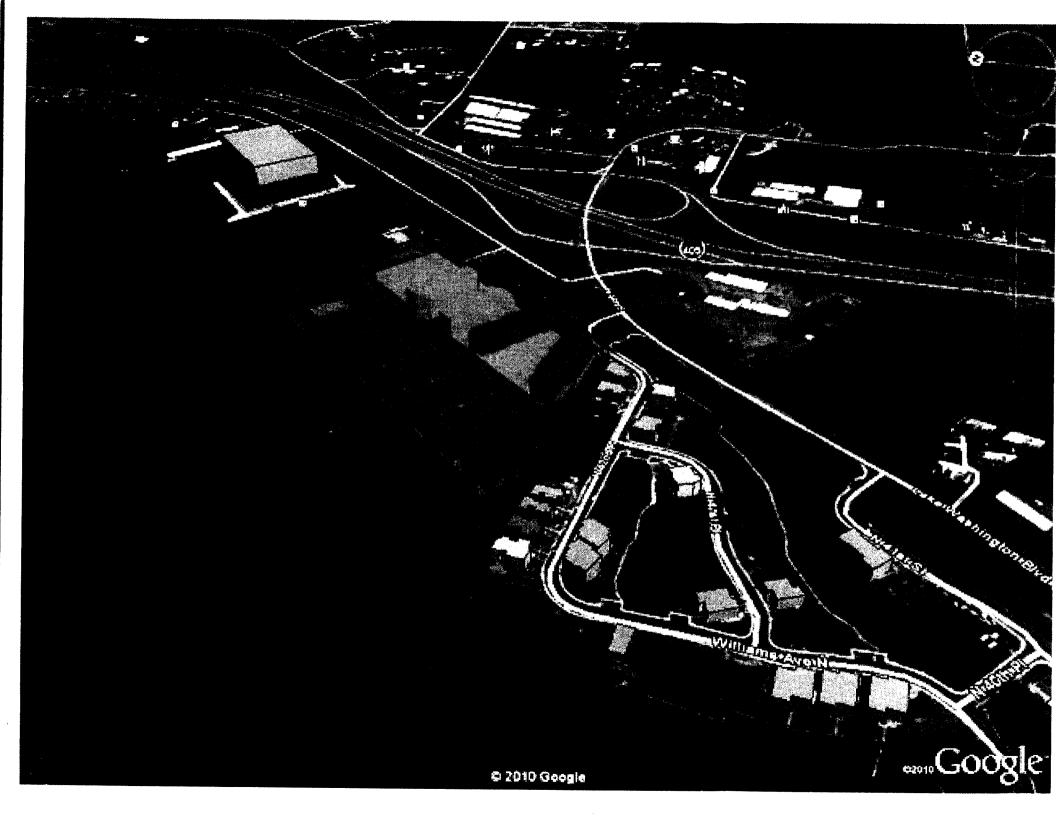
• Creosote Council (http://www.creosotecouncil.org)



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## **Focus on Puget Sound**



**Environmental Assessment Program** 

May 2011

## **Toxics in surface runoff to Puget Sound**

In our state's effort to restore and recover Puget Sound, the Washington State Department of Ecology (Ecology) and other organizations are evaluating the loadings, pathways, sources, and hazards of toxic chemicals (toxics) released into the Puget Sound ecosystem. These studies will help guide decisions about how to most effectively direct resources to reduce toxic contamination in Puget Sound.

The study, Toxics in Surface Runoff to Puget Sound: Phase 3
Data and Load Estimates, www.ecy.wa.gov/biblio/1103010.html,
represents one component of this larger effort. Earlier phases of
the Puget Sound toxic loading studies identified surface runoff
as the largest contributor of toxic chemicals to Puget Sound.
The purpose of this study is to determine the relative chemical
contributions from different land-cover types and to refine
chemical load estimates. Ecology worked with a team of local
experts and used independent third-party review to ensure that
the scientific methods used were credible.

Ecology will combine information from these multiple studies to address the following questions about specific toxic chemicals in Puget Sound:

- Where do the toxic chemicals come from?
- How much is being delivered?
- What delivery pathways contribute toxic loads to Puget Sound?
- What is the relative importance of these chemicals?

## Broad range of chemicals analyzed

The study analyzed many different chemicals and groups of chemicals in surface runoff including:

- Heavy metals
- Polycyclic aromatic hydrocarbons (PAHs)
- Flame retardants such as polybrominated diphenyl ethers (PBDEs)
- Polychlorinated biphenyls (PCBs)
- Total petroleum hydrocarbons
- · Oil and grease
- Phthalates
- Pesticides (herbicides and insecticides)
- Semi-volatile compounds
- Nutrients

#### WHY IT MATTERS

Polluted stormwater runoff is the leading pollution threat to our lakes, rivers, streams, and Puget Sound. Broadly speaking, the primary contaminants in stormwater runoff are nutrients, bacteria, sediment, and toxic chemicals.

Nutrients from fertilizers and animal wastes (manure) cause algae blooms that can rob oxygen from water. Bacteria from animal wastes and failing septic systems can make people sick and can make shellfish unhealthy to eat. Fine sediments can smother aquatic habitats and carry toxic chemicals. Stormwater scours river channels, which creates erosion and muddy runoff that carries fine sediments.

Toxic chemicals may be our biggest challenge because they get into the ecosystem from so many diffuse and hard-to-trace sources. Once released, toxic chemicals can affect the environment and human health.

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## Study characterized four land-cover types

Surface runoff includes stormwater as well as baseflow in rivers and streams draining to Puget Sound. Baseflow is the water in a stream or river before it rains and comes from underground sources called groundwater. Surface runoff was sampled from four land-cover types:

- Commercial/industrial
- Residential
- Agricultural
- Forest, field, and other undeveloped lands

The study collected water samples from small streams before and during storm events. From August 2009 through July 2010, samples were collected from 16 streams within the Puyallup River and Snohomish River watersheds. Monitoring took place during six storm events distributed over the fall, winter, and spring and during two periods of baseflow. Monitoring also included measuring the streamflows in these watersheds continuously during this study period.

## Pollutant levels higher during storms

The study found toxic chemicals more frequently and at higher levels during storm events compared with the baseflow in streams between storms. Toxic loads were substantially higher during storm events than for baseflow across all four land-cover types.

## Runoff pollutant levels higher from developed lands than from forested lands

During storm events, toxic chemicals were generally found most frequently and at highest levels in streams in commercial/industrial sub-basins and at lowest levels in forested sub-basins. Agricultural and residential stormwater also contained higher levels of many toxic chemicals compared to stormwater from forested lands.

A substantial number of storm-event samples, primarily from commercial/industrial lands, did not meet state and federal water quality or human health standards for several chemicals:

- Dissolved copper, lead, and zinc
- Total mercury
- PCBs
- Bis(2-ethylhexyl) phthalate
- Several carcinogenic PAHs
- Pentachlorophenol, a pesticide

# Commercial/industrial lands have highest loading rate; forest lands have highest total load

Toxic loading *rates*, or the mass per unit of area, are highest in commercial/industrial lands compared to the other three land covers. Since commercial and industrial lands occupy less than 1 percent of the Puget Sound watershed, the *total* loads from commercial/industrial lands are lower than the other land covers.

Most toxic chemicals were infrequently found in runoff from forested lands. However, forested lands occupy 83 percent of the land surface draining to Puget Sound. When contributions are added across all forest land, the combination of low chemical concentration but high streamflow volume translates to high chemical loads. Loads from forested lands may represent naturally occurring chemicals, chemicals deposited from the atmosphere, or other human sources of chemicals.

The highest chemical levels were found in stormwater from the most developed land uses. This is also where violations of water quality and human health standards occurred. However, looking only at the *total* chemical load for the Puget Sound watershed as a whole may mask these hot spots in the ecosystem where localized high levels occur.

## Study refines loading estimates

This surface runoff study used locally-derived contaminant levels to estimate loads. Levels in this study were lower than in the Phase 1 and 2 analyses because streams were sampled directly. Phase 1 and 2 relied on initial estimates based on a literature search of historical data from other regions and a mix of data from streams and stormwater conveyance systems. By collecting samples directly from streams, Ecology took into account environmental processes such as dilution, deposition, degradation, and other mechanisms that reduce concentrations of pollutants as they move away from their sources. PBDEs are an exception since concentrations were higher compared with those used for earlier load estimates.

Loads (pounds per year)	Oil & Grease (pounds per year)	Petroleum (pounds per year)	Zinc (pounds per year)	Copper (pounds per year)	Total PAHs (pounds per year)	
Estimates based on local sampling:						
Phase 3	18,000,000 – 23,000,000	710,000 – 800,000	250,000 – 300,000	61,000 – 140,000	300 – 600	
Initial estimates based on historical data:						
Phase 1*	21,000,000 – 120,000,000	Not distinguished from oil & grease	380,000 <b>–</b> 1,400,000	110,000 — 440,000	7,800 – 63,000	
Phase 2**	13,000,000 <b>–</b> 92,000,000	Not distinguished from oil & grease	220,000 <b>–</b> 970,000	69,000 <b>–</b> 320,000	3,000 – 27,000	

<sup>\*</sup> www.ecy.wa.gov/biblio/0710079.html

The local sampling effort in this study also distinguished between petroleum and "oil and grease," which was not done for the Phase 1 and 2 analyses. Oil and grease is a pollutant that has been used as a surrogate for petroleum in other loadings studies but is not a direct measure of petroleum. Oil and grease can include other components such as animal fats, vegetable oils, soaps, and other biological oils. The local data indicate a similar amount of oil and grease compared to previous estimates. The laboratory method for total petroleum hydrocarbons provides a more direct estimate for petroleum-based products alone. Petroleum-based contributions are much lower than the total oil and grease load, although petroleum remains the largest contributor by mass of any other contaminant sampled. Petroleum loads are roughly two to three times more than zinc, the next largest contributor by mass to Puget Sound.

<sup>\*\*</sup> www.ecy.wa.gov/biblio/0810084addendum2.html

In addition to using local experts to inform and review the study, Ecology requested that the U.S. Environmental Protection Agency (EPA) manage a paid independent peer review by a panel of national experts. Some independent reviewers commented that the methods agreed upon by our local experts may underestimate loadings.

#### **Conclusions**

- Surface runoff is the largest contributor for most chemicals sampled.
- Pollutant levels are higher during storms than baseflow.
- Commercial/industrial areas have higher loading rates than other land-cover types.
- Petroleum-based contributions are much lower than the total oil and grease load, although petroleum remains the largest contributor by mass of any other contaminant sampled.

#### What's next?

Information from the report will be combined with other studies from the toxics loading project to provide context for the loading estimates by identifying their sources and potential hazards. Ecology and its partners will use the information to help hone strategies for controlling toxic chemicals in the Puget Sound ecosystem. These strategies will be refined over time to reflect new information and new approaches for toxics reduction in Puget Sound.

#### **Websites**

Control of Toxic Chemicals in Puget Sound web page: www.ecy.wa.gov/programs/wq/pstoxics/index.html

The focus sheet, *Update: Control of Toxic Chemicals in Puget Sound:* www.ecy.wa.gov/biblio/1103012.html

The report, Toxics in Surface Runoff to Puget Sound: Phase 3 Data and Load Estimates: www.ecy.wa.gov/biblio/1103010.html

This focus sheet, Focus on: Toxics in Surface Runoff to Puget Sound: www.ecy.wa.gov/biblio/1103025.html

## Glossary

For definitions of terms used in this focus sheet, see the report listed above.

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# RECEIVED JUL 2 0 2005 CITY OF RENTON UTILITY SYSTEMS

#### CITY OF RENTON, WASHINGTON

## RESOLUTION NO. 3761

# A RESOLUTION OF THE CITY OF RENTON, WASHINGTON RATIFYING THE WATER RESOURCE INVENTORY AREA (WRIA) 8 CHINOOK SALMON CONSERVATION PLAN

WHEREAS, in March 1999, the National Oceanic and Atmospheric Administration (NOAA) Fisheries listed the Puget Sound Chinook salmon evolutionary significant unit as a threatened species under the Endangered Species Act (ESA); and

WHEREAS, in November 1999, the United States Fish and Wildlife Service (USFWS) listed the Puget Sound bull trout distinct population segment as a threatened species under the ESA; and

WHEREAS, under the ESA, it is illegal to take a listed species, and the ESA defines the term "take" to include actions that could harm listed species or their habitat; and

WHEREAS, actions that are directly or indirectly authorized by local governments could potentially expose local governments to civil or criminal penalties under the ESA; and

WHEREAS, under the ESA, Section 4(f), NOAA Fisheries (for Chinook salmon) and USFWS (for bull trout) are required to develop and implement recovery plans to address the recovery of the species; and

WHEREAS, an essential ingredient for the development and implementation of an effective recovery program is coordination and cooperation among federal, state, and local agencies, tribes, businesses, researchers, non-governmental organizations, landowners, citizens, and other stakeholders as required; and

WHEREAS, Shared Strategy for Puget Sound, a regional non-profit organization, has assumed a lead role in the Puget Sound response to developing a recovery plan for submittal to NOAA Fisheries and the USFWS; and

WHEREAS, Shared Strategy intends that its recovery plan will include commitments from participating jurisdictions and stakeholders; and

WHEREAS, local jurisdictions have authority over some habitat-based aspects of Chinook survival through land use and other policies and programs; and the state and tribes, who are the legal co-managers of the fishery resource, are responsible for addressing harvest and hatchery management in WRIA 8; and

WHEREAS, in WRIA 8, habitat actions to significantly increase Chinook productivity trends are necessary, in conjunction with other recovery efforts, to avoid extinction in the near term and restore WRIA 8 Chinook to viability in the long term; and

WHEREAS, the City of Renton values ecosystem health; water quality improvement; flood hazard reduction; open space protection; and maintaining a legacy for future generations, including commercial, tribal, and sport fishing, quality of life, and cultural heritage; and

WHEREAS, the City of Renton supports cooperation at the WRIA level to set common priorities for actions among partners, efficient use of resources and investments, and distribution of responsibility for actions and expenditures;

WHEREAS, 27 local governments in WRIA 8 jointly funded development of *The WRIA* 8 Steering Committee Proposed Lake Washington/Cedar/Sammamish Watershed Chinook Salmon Conservation Plan (the Plan), published February 25, 2005 following public input and review; and

WHEREAS, while the Plan recognizes that salmon recovery is a long-term effort, it focuses on the next 10 years and includes a scientific framework, a start-list of priority actions and comprehensive action lists, an adaptive management approach, and a funding strategy; and

WHEREAS, the City of Renton has consistently implemented habitat restoration and protection projects, and addressed salmon habitat through its land use and public outreach policies and programs over the past five years; and

WHEREAS, it is important to provide jurisdictions, the private sector and the public with certainty and predictability regarding the course of salmon recovery actions that the region will be taking in the Lake Washington/Cedar/Sammamish Watershed, including the Puget Sound nearshore; and

WHEREAS, if insufficient action is taken at the local and regional level, it is possible that the federal government could list Puget Sound Chinook salmon as an endangered species, thereby decreasing local flexibility;

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF RENTON, WASHINGTON, DOES RESOLVE AS FOLLOWS:

**SECTION I.** The above findings are true and correct in all respects.

SECTION II. The City of Renton hereby ratifies The WRIA 8 Steering Committee Proposed Lake Washington/Cedar/Sammamish Watershed Chinook Salmon Conservation Plan, dated February 25, 2005 (the Plan). Ratification is intended to convey the City of Renton's approval and support for the following:

- 1. The following goals for the Plan:
- a) The Plan mission statement to conserve and recover Chinook salmon and other anadromous fish, focusing on preserving, protecting and restoring habitat with the intent to

recover listed species, including sustainable, genetically diverse, harvestable populations of naturally spawning Chinook salmon.

- b) The multiple benefits to people and fish of Plan implementation including water quality improvement; flood hazard reduction; open space protection; and maintaining a legacy for future generations, including commercial, tribal and sport fishing, quality of life, and cultural heritage.
- Continuing to work collaboratively with other jurisdictions and stakeholders in the
   Lake Washington/Cedar/Sammamish Watershed (WRIA 8) to implement the Plan.
- 3. Using the scientific foundation and the conservation strategy as the basis for local actions recommended in the plan and as one source of best available science for future projects, ordinances, and other appropriate local government activities.
- 4. Adopting an adaptive management approach to Plan implementation and funding to address uncertainties and ensure cost-effectiveness by tracking actions, assessing action effectiveness, learning from results of actions, reviewing assumptions and strategies, making corrections where needed, and communicating progress. Developing and implementing a cost-effective regional monitoring program as part of the adaptive management approach.
- 5. Using the comprehensive list of actions, and other actions consistent with the Plan, as a source of potential site specific projects and land use and public outreach recommendations.

  Jurisdictions, agencies, and stakeholders can implement these actions at any time.
- 6. Using the start-list to guide priorities for regional funding in the first ten years of Plan implementation, and implementing start-list actions through local capital improvement projects, ordinances, and other activities. The start-list will be revised over time, as new opportunities arise and as more is learned through adaptive management.

- 7. Using an adaptive approach to funding the Plan through both local sources and by working together (within WRIA 8 and Puget Sound) to seek federal, state, grant, and other funding opportunities. The long-term ultimate goal is to fund the Plan through a variety of sources at the current 2004 level plus 50 percent, recognizing that this resolution cannot obligate future councils to financial commitment and that the funding assumptions, strategies, and options will be revisited periodically.
- 8. Forwarding the Plan to appropriate federal and state agencies through Shared Strategy for Puget Sound, to be included in the Puget Sound Chinook salmon recovery plan.

SECTION III. The City of Renton recognizes that negotiation of commitments and assurances/conditions with appropriate federal and state agencies will be an iterative process. Full implementation of this Plan is dependent on the following:

- NOAA Fisheries will adopt the Plan, as an operative element of its ESA Section
   4(f) recovery plan for Puget Sound Chinook salmon.
  - 2. NOAA Fisheries and USFWS will:
- a) take no direct enforcement actions against the City of Renton under the ESA for implementation of actions recommended in or consistent with the Plan,
- b) endorse the Plan and its actions, and defend the City of Renton against legal challenges by third parties, and
- c) reduce the regulatory burden for City of Renton activities recommended in or consistent with the Plan that require an ESA Section 7 consultation.
  - 3. Federal and state governments will:
- a) provide funding and other monetary incentives to support Plan actions and monitoring activities,

b)	streamline permitting for projects implemented primarily to restore					
salmonid habitat or where the actions are mitigation that further Plan implementation,						
c)	offer programmatic permitting for local jurisdiction actions that are					
consistent with the Plan,						
d)	accept the science that is the foundation of the Plan and support the					
monitoring and evalu	monitoring and evaluation framework,					
e)	incorporate actions and guidance from the Plan in future federal and state					
transportation and infrastructure planning and improvement projects, and						
f)	direct mitigation resources toward Plan priorities.					
<b>SECTION IV.</b> This resolution does not obligate the City of Renton Council to						
future appropriations beyond current authority.						
PASSED BY	THE CITY COUNCIL this 18th day of July , 2005.					
	Bonnie S. Walton					
	Bonnie I. Walton, City Clerk					
APPROVED BY THE MAYOR this <u>l8th</u> day of <u>July</u> , 2005.						
	1 Paris					
	Hemenere					
Approved 2520 form	Terri Briere, Mayor Pro Tem					
Lauren	Allaner					
Lawrence J. Warren,						
RES 1120:6/29/05:m	ıa					



## The Science of Stormwater

King County's water resources - its streams, lakes, wetlands, groundwater, and Puget Sound - play an important role in the quality of life we enjoy. They provide us recreation and drinking water, support tourism and salmon, and are used by industry. These waters, however, are vulnerable to pollution from a wide variety of human activities.

#### This Page Discusses:

- · What stormwater is, where it comes from, and why it is important (#whatis)
- · How it is polluted, including details on specific pollutants and their sources (#pollutants)
- How stormwater pollution is controlled (#controls).
- What are Stormwater Facilities, and how do they work? (http://www.kingcounty.gov/environment/waterandland/stormwater/introduction/facilities.aspx)
- What businesses need to do to protect stormwater (#businesses)
- What homeowners can do to protect stormwater (#homeowners)

## What is Stormwater, Where Does it Come From, and Why is it Important?

Many of our water pollution problems are due in large part to pollutants that are washed off the land by storms. The quality of stormwater from public facilities, commercial and industrial businesses, residences, and agricultural lands is an increasing concern nationwide. Many people believe that stormwater is "clean" and that it does not harm water quality. This perception is understandable since the amount of pollution from any one spot is not usually significant by itself. But when all these small amounts are combined, they can cause big water quality problems.

In vegetated areas such as forests, fields and wetlands rain water seeps into the ground. However, when rain falls on paved and other hard surfaces it runs off and is conveyed by pipes and ditches directly to King County's lakes, wetlands, and streams. This water that flows across the land is called stormwater runoff. Stormwater runoff although starting as rain, collects pollutants when it hits the ground and travels. For example, runoff from parking lots picks up oil and grease dripped from cars, asbestos from worn brake linings, and zinc from tires. Pesticides, herbicides, and fertilizers are washed off from landscaped areas, and soils are washed away from construction sites. Any substance found on the ground can wind up in stormwater runoff.

#### Storm Drains Lead to Lakes and Streams

Storm drainage systems are designed to decrease the chance of flooding in areas that have been developed with homes, businesses, and roads. The rainwater that used to seep into vegetated areas now must be collected and carried elsewhere. The storm drainage system collects this storm water runoff and carries it to the nearest wetland, lake, stream, or to Puget Sound. In urban areas the storm drainage system consists of drains and underground pipes. Storm drains are normally located in streets and parking lots. In rural areas the storm drainage system may be in the form of ditches that carry the stormwater along a roadside or piece of property. These drainage systems are meant to carry only unpolluted stormwater to the nearest natural body of water. Putting oil, antifreeze,

#### detergents, and other material into the storm drainage system is the same as dumping them directly into a lake or stream.

The sanitary sewer system is different. Sanitary sewer drains lead to the sanitary sewer system and end up at a wastewater treatment plant. This system carries household wastewater and some permitted industrial wastewater. The wastewater in this system is treated before being discharged into a natural water body.

Keeping pollutants out of the water isn't just a good idea - it's the law. The Washington State Water Pollution Control Law (RCW 90.48) and the King County Code (KCC 9.12) prohibit the discharge of pollutants to the storm drainage system, surface water and groundwater. Direct dumping of material or polluted stormwater can negatively affect every water body it enters. Pollution can cause: algal blooms that cause taste and odor problems and impaired recreation and aesthetics; lesions and tumors in fish and other animals; destruction of fish spawning areas and other habitat for plants and animals; decrease in fishing, swimming, and boating opportunities.

Many people know that it is illegal to dump toxic chemicals or other material down a storm drain. But you also are polluting if you allow pollutants to be washed into a storm drain with stormwater runoff or with wash water. For instance, you may be polluting if you:

- allow wash water from engine or equipment or car washing to enter a storm drain;
- · spill antifreeze or other material without cleaning it up;
- · allow materials or wastes stored outside to leak on the ground; or
- · clear land without taking steps to prevent erosion.

## Stormwater Pollutants

Any substance that can render water harmful to people, fish, or wildlife or impair recreation or other beneficial uses of water is considered a pollutant. The broad categories of pollutants and their effects on fish and wildlife are described below.

- Oils and Greases (#oilgrease)
- Metals (#metals)
- Sediments (#sediments)
- Oxygen-Demanding Substances (#oxygendemand)
- Nutrients (#nutrients)
- Toxic Organic Compounds (#toxicorganics)
- Fecal Coliform Bacteria (#fecalcoliform)
- · pH (#ph)

#### Oils and Greases

Oils and greases are a common component of stormwater runoff pollutants, primarily because there are so many common sources: streets and highways, parking lots, food waste storage areas, heavy equipment and machinery storage areas, and areas where pesticides have been applied. The familiar sight of a rainbow-colored puddle or trickling stream in parking lots, driveways, and street gutters is a reminder of the presence of oils and greases in stormwater runoff. Oils and greases can be petroleum-based or food-related (such as cooking oils). No type of oil or grease belongs in surface water. Oil and grease are known to be toxic to aquatic organisms at relatively low concentrations; they can coat fish gills, prevent oxygen from entering the water, and clog drainage facilities (leading to increased maintenance costs and potential flooding problems).

#### Metals

Many heavy metals, including lead, copper, zinc and cadmium, are commonly found in urban runoff. Metals can contaminate surface and ground waters and concentrate in bottom sediments, presenting health problems for fish and animals that eat from the bottom. Reproductive cycles of bottom-dwelling species can be severely reduced, and fish inhabiting such metal-contaminated locations often exhibit lesions and tumors. Metals can also contaminate drinking water supplies. Industrial areas, scrap yards, paints, pesticides, and fallout from automobile emissions are typical sources of heavy metals in runoff.

#### **Sediments**

Sediment - often originating as topsoil, sand, and clay - is the most common pollutant in stormwater runoff by volume and weight. Sediments readily wash off paved surfaces and exposed earth during storms. Sediment may seem harmless enough, but it poses serious problems in the water. Excess sediment concentrations turn stream and lake water cloudy, making it less suitable for recreation, fish life, and plant growth. Sediment is of particular concern in fish bearing streams where it can smother trout and salmon eggs, destroy habitat for insects (a food source for fish), and cover prime spawning areas. Uncontrolled sediment can also clog storm drains, leading to increased private and public maintenance costs and flooding problems. Sediment is also of concern because many other pollutants including oils, metals, bacteria, and nutrients tend to attach to soil particles. Therefore when sediments enter water they usually carry other pollutants with them. Cleared construction sites and exposed earth are generally the greatest contributors of soil particles in surface waters. Other sources include erosion from agricultural lands, application of sand and salts to icy roads, fallout from pressure washing and sandblasting operations, dirt from equipment and vehicles, and dirt and grit from parking lots, driveways, and sidewalks.

## Oxygen-Demanding Substances

Plant debris, food waste, and some chemical wastes fall into a category of water pollutants known as oxygen demanding substances. Such substances use dissolved oxygen in water when they decay or chemically react. If dissolved oxygen levels in water become too low, aquatic animals can become stressed or die. Salmon and trout are particularly at risk because they need high dissolved oxygen levels to live.

Animal wastes, food wastes, leaves and twigs, and other miscellaneous organic matter carried by stormwater runoff into surface water can lead to reduced oxygen levels. Slowmoving waters are particularly susceptible to oxygen depletion because aeration of the water by turbulence is lacking. Therefore, oxygen that is depleted in slow-moving waters due to the presence of excess organic matter or unnatural chemical compounds is not replaced. Reduced oxygen levels in these waters are often particularly severe after a storm.

#### Nutrients

Nutrients such as phosphorus and nitrogen are needed by plants to grow, but high levels can be harmful to water quality. Excess nutrient levels can over-stimulate the growth of algae and other aquatic plants, resulting in unpleasant odors, unsightly surface scums, and lowered dissolved oxygen levels from plant decay. Nutrients are most likely to pose a problem in slow moving water such as lakes or sluggish streams. Some forms of algae are toxic to fish and other aquatic organisms and may even cause death in animals that drink affected water. Algae can also cause taste and odors problems in drinking waters, foulsmelling odor in ponds and lakes, and problems with clogged water intakes, drains, and pipes. Heavy loading of nutrients into slow-moving waters can adversely affect many beneficial uses of the water. Forms of nitrogen (ammonium), in combination with pH and temperature variations, can cause water quality problems and be toxic to fish. This process consumes large amounts of oxygen in the water and subsequently stresses or kills fish and other aquatic organisms when oxygen levels are reduced. Ammonia toxicity, due to nitrogen in its ammonium form, can harm fish and other aquatic organisms.

Fertilizers, animal wastes, failing septic systems, detergents, road deicing salts, automobile emissions, and organic matter such as lawn clippings and leaves are all contributors to excessive nutrient levels in urban and agricultural stormwater runoff.

## **Toxic Organic Compounds**

Pesticides and PCBs are toxic organic compounds that are particularly dangerous in the aquatic environment. Excessive application of insecticides, herbicides, fungicides, and rodenticides, or application of any of these shortly before a storm, can result in toxic pesticide chemicals being carried from agricultural lands, construction sites, parks, golf courses, and residential lawns to receiving waters. Many pesticide compounds are extremely toxic to aquatic organisms and can cause fish kills. PCBs are a similar class of toxic organic compounds. They can contaminate stormwater through leaking electrical transformers. PCBs can settle in sediments of receiving waters and, like pesticide compounds, present a serious toxic threat to aquatic organisms that come in contact with them. Many other toxic organic compounds can also affect receiving waters. These toxic compounds include phenols, glycol ethers, esters, nitrosamines, and other nitrogen compounds. Common sources of these compounds include wood preservatives, antifreeze, dry cleaning chemicals, cleansers, and a variety of other chemical products. Like pesticides and PCBs these other toxic organic compounds can be lethal to aquatic organisms.

#### Fecal Coliform Bacteria

Fecal coliform bacteria in water may indicate the presence of pathogenic (disease-causing) bacteria and viruses. Pet and other animal wastes, failing septic systems, livestock waste in agricultural areas and on hobby farms, and fertilizers can all contribute fecal coliform bacteria. This can be a problem for treatment of drinking water and can limit recreational use of a water body. Bacterial contamination has led to closures of numerous shellfish harvesting areas and public swimming beaches in Puget Sound.

#### pН

The pH value of water is an indication of its relative acidity. The pH value can range from 0 to 14, with a range of 6 to 8 being desirable for most bodies of water. Waters with very high (basic) or very low (acidic) pH are corrosive to metal surfaces and can cause biological problems for aquatic organisms and fish. There are several sources that can contribute to change of pH in runoff. These include industrial processes that discharge acidic wastewater, solutions used in metal plating operations, acidic chemicals used in printing and graphic art businesses, cement used in concrete products and concrete pavement, and chemical cleaners used in homes and businesses.

## **Controlling Pollutants**

The federal Clean Water Act mandates that cities and counties control the quality of stormwater runoff. One way to achieve this requirement is to implement pollution prevention measures on individual properties. These measures are often referred to as Best Management Practices, or BMPs.

Stormwater runoff seeps into the ground, drains to a storm sewer or a drainage ditch, or flows over the ground. Regardless of the way runoff leaves a site, it ends up in a stream, lake, wetland, groundwater, or Puget Sound.

Contaminated stormwater can negatively affect every waterbody it enters. Best Management Practices provide detailed information on what we are all required to do to reduce the contamination of surface water, groundwater, and stormwater from our properties. It shows that we are all doing our part to protect our quality of life. Stormwater BMPs are required for all properties except single family residences. Single family homeowners contribute to stormwater pollution as well, and there are things that they can and should do to reduce pollution.

#### BMPs - What exactly are they?

BMPs are methods of improving stormwater quality, and thus surface water and groundwater. BMPs encompass a variety of managerial, operational, and structural measures that will reduce the amount of contaminants in stormwater and improve the quality of our water resources.

#### BMPs are separated into two broad categories: source control and treatment.

Source-control BMPs prevent contaminants from entering water bodies or stormwater runoff. Some source-control BMPs are operational, such as checking regularly for leaks and drips, and educating employees about site clean-up procedures. Other source-control BMPs require use of a structure to prevent rainwater from contacting materials that will contaminate stormwater runoff. Examples of these BMPs include a covered area or berm to prevent clean stormwater from entering work areas.

In contrast, treatment BMPs are structures that treat the stormwater to remove the contaminants. Most treatment BMPs require elaborate planning, design and construction. No treatment BMP is capable of removing 100 percent of the contaminants in stormwater.

## **BMPs for Businesses**

Refer to Chapter 3 in the 2009 Stormwater Pollution Prevention Manual (http://www.kingcounty.gov/environment/waterandland/stormwater/documents/pollutionprevention-manual.aspx).

#### **Good Practices for Homeowners**

#### There are things we can do at home to reduce stormwater pollution in the region:

Waste Disposal and Spills

- 1. Never dispose of oils, pesticides, or other chemicals onto driveways, roadways or storm drains. The next rain will carry it into a surface water or help it soak into ground water.
- 2. Report polluters and spills. (http://www.kingcounty.gov/environment/waterandland/stormwater/probleminvestigation-line.aspx)
- 3. Stencil storm drains with "DUMP NO WASTE, DRAINS TO SOUND" message.

#### Drainage

- 1. Consider replacing impervious surfaces like sidewalks, decks, and driveways around your home with more pervious materials or methods like mulch, turf block, pervious concrete or clean stone.
- 2. Review your home for storm water handling. If your gutters, downspouts, driveways, or decks directly discharge into a water body, retrofit them by redirecting the runoff onto grassy areas or installing berm/swale systems.

3. Collect stormwater runoff in closed rain barrels and use if for yard and garden watering.

#### Car Care

- 1. Make sure your automobile isn't leaking fluids.
- 2. Instead of washing your car at home, take it to a commercial car wash. The drains in commercial car washes are connected to the sanitary sewer system, so rinse water doesn't wash down storm drains. Many commercial car washes conserve water by recycling rinse water.
- 3. If you must wash your car at home, use a mild dishwashing liquid and try to keep the soapy water from flowing to a storm drain. Park your car on grass or vegetation that will absorb the water, and use a spray nozzle that shuts off.

#### Yard and Garden Care

#### 1. Practice natural lawn care

(http://your.kingcounty.gov/solidwaste/naturalyardcare/lawncare.asp) to reduce the use of hazardous products while saving time, water, money, and helping to preserve the environment.

- 2. Instead of cleaning walkways with a hose, sweep up grass clippings, leaves, twigs and put them into a yard waste container or compost pile. Sweep up dirt and put it back into the garden. This way, you won't accidentally wash debris into a storm drain or waterway, and you'll save water.
- 3. Choose plants and trees that resist pests and disease. Certain flowering cherry trees are resistant to brown rot. Some roses are resistant to aphids and mildew. Certain rhododendrons are resistant to root weevils and are drought tolerant. Nurseries can help you in making choices.
- 4. Avoid using weed and feed products. Applying this product to your entire lawn is overkill for weed control. Pull weeds by hand or with tools. If you decide to use a weed killer, wear gloves, spot spray just the weed, and spray when it isn't windy or when rain isn't predicted. Never use pesticides, fertilizers, or herbicides near streams, lakes, or wetlands.
- 5. Avoid using Diazinon, often used to treat crane flies in lawns. This pesticide has also been found in our streams, and the Environmental Protection Agency is phasing it out because of the potential health risk to children.
- 6. If you have an irrigation system, make sure it is in good working order and limit its use to actual watering needs.
- 7. Collect stormwater runoff in closed rain barrels and use if for yard and garden watering
- 8. Retain shrubby vegetation along waterfronts to prevent erosion and help stop heavy rain sheet flow.
- 9. Stencil storm drains DUMP NO WASTE DRAINS TO SOUND

#### Pool or Spa Care

- 1. Do not drain your pool or spa to a lot, ditch or outside drain where water could enter groundwater, a stream or lake, or a storm drain.
- 2. Do not drain your pool or spa to a septic system, as this action could cause the system to fail.

For questions about the Stormwater Web Site, please contact Dale Nelson (http://directory.kingcounty.gov/EmployeeDetail.asp?EmplD=36327), Engineer II, King County Stormwater Services Section. (http://www.kingcounty.gov/environment/wlr/stormwaterservices.aspx)

#### Related information

- Drinking Water (http://www.kingcounty.gov/environment/waterandland/drinkingwater.aspx)
- Flooding Topics (http://www.kingcounty.gov/environment/waterandland/flooding.aspx)
- Ground Water (http://www.kingcounty.gov/environment/waterandland/groundwater.aspx)
- King County Watersheds (http://www.kingcounty.gov/environment/watersheds.aspx)
- Surface Water Management Fee (http://www.kingcounty.gov/environment/wlr/surface -water-mgt-fee.aspx)

## **Agencies**

 Water and Land Resources Division (http://www.kingcounty.gov/environment/wlr.aspx)

> Home (http://www.kingcounty.gov/) | Privacy (http://www.kingcounty.gov/About/privacy.aspx) | Accessibility (http://www.kingcounty.gov/About/access.aspx) | Terms of use (http://www.kingcounty.gov/About/termsOfUse.aspx) | Search (http://www.kingcounty.gov/About/search.aspx)

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A study in Connecticut compared driveways constructed from conventional asphalt and permeable pavers (UNI group Eco-Stone) for runoff depth (precipitation measured on-site), infiltration rates, and pollutant concentrations. The Eco-Stone driveways were two years old. During 2002 and 2003, mean weekly runoff depth recorded for asphalt was 1.8 mm compared to 0.5mm for the pavers. Table 6.3.1 summarizes pollutant concentrations from the study (Clausen and Gilbert, 2003).

Table 6.3.1 Mean weekly pollutant concentration in stormwater runoff, Jordan Cove, CT.

Variable	Asphalt	Paver
TSS	47.8 mg/L	15.8 mg/L
NO <sub>3</sub> -N	0.6 mg/L	0.2 mg/L
NH <sub>3</sub> -N	0.18 mg/L	0.05 mg/L
TP	0.244 mg/L	0.162 mg/L
Си	18 ug/L	6 ug/L
Pb	6 ug/L	2 ug/L
Zn	87 ug/L	25 ug/L

(Adapted from Clausen and Gilbert, 2003)

In the Puget Sound region, a six-year permeable parking lot demonstration project conducted by the University of Washington found toxic concentrations of copper and zinc in 97 percent of the surface runoff samples from an asphalt control parking stall. In contrast, copper and zinc in 31 of 36 samples from the permeable parking stall—that produced primarily subsurface flow-fell below toxic levels and a majority of samples fell below detectable levels. Motor oil was detected in 89 percent of the samples from the surface flow off the asphalt stall. No motor oil was detected in any samples that infiltrated through the permeable paving sections. (Brattebo and Booth, 2003).

## 6.4 Vegetated Roofs

Vegetated roofs (also known as green roofs and eco-roofs) fall into two categories: intensive and extensive. Intensive roofs are designed with a relatively deep soil profile (6 inches and deeper) and are often planted with ground covers, shrubs, and trees. Intensive green roofs may be accessible to the public for walking or serve as a major landscaping element of the urban setting. Extensive vegetated roofs are designed with

Vegetated roofs improve energy efficiency and air quality, reduce temperatures and noise in urban areas, improve aesthetics, extend the life of the roof, and reduce stormwater flows.

shallow, light-weight soil profiles (1 to 5 inches) and ground cover plants adapted to the harsh conditions of the roof top environment. This discussion focuses on the extensive design.

Extensive green roofs offer a number of benefits in the urban landscape including: increased energy efficiency, improved air quality, reduced temperatures in urban areas, noise reduction, improved aesthetics, extended life of the roof, and central to this discussion, improved stormwater management (Grant, Engleback and Nicholson, 2003).

Companies specializing in vegetated roof installations emerged in Germany and Switzerland in the late 1950s, and by the 1970s extensive green roof applications were common in those countries. In 2003, 13.5 million square meters of green roofs were installed in Germany (Grant et al., 2003; Peck, Callaghan, Kuhn and Bass, 1999; and Peck, Kuhn and Arch, n.d.). While roof gardens are not as prevalent in the U.S., designers in North America are discovering the value of the technology and green

roofs are becoming more common with installations on large buildings and individual residences in Portland, Philadelphia, Chicago, Seattle, and other cities.

**Figure 6.4.1** Vegetated roof on the Multnomah County building in Portland, Oregon.

Photo by Erica Guttman



## 6.4.1 Applications

Initial vegetated roof installations in the 1970s were prone to leaking. New technologies and installation techniques have improved and essentially eliminated past problems. Green roofs can be installed on almost any building with slopes up to 40 degrees and are effective strategies for managing stormwater in highly urbanized settings where rooftops comprise a large percentage of the total impervious surface (Scholtz-Barth, 2001).

## 6.4.2 Design

Native soils are heavy and would exert unnecessarily heavy loads for an extensive green roof installation, particularly when wet. Extensive roofs utilize light-weight soil mixes to reduce loads. Installations often range from 1 to 6 inches in depth and research from Germany indicates that, in general, a 3-inch soil depth offers the best environmental and aesthetic benefit to cost ratio (Miller, 2002).

While roof gardens can be installed on slopes up to 40 degrees, slopes between 5 and 20 degrees (1:12 and 5:12) are most suitable, and can provide natural drainage by gravity (depending on design, sloped roofs may also require a drainage layer). Flat roofs require a drainage layer to move water away from the root zone and the waterproof membrane. Roofs with slopes greater than 20 degrees require a lath grid to hold the soil substrate and drainage aggregate in place (Scholtz-Barth, 2001).

Vegetated roofs are comprised of four basic components: waterproofing membrane, drainage layer, growth medium, and vegetation. (See Figure 6.4.2 for a typical cross-section of a green roof.)

Waterproof membranes are made from PVC, Hypolan, rubber (EPDM) or polyolifins. Sixty to 80-mil reinforced PVC with heat sealed seams provides a highly durable and waterproof membrane. EPDM seams must be glued and may be more susceptible to leakage. Thermoplastic polyolifins are currently not well tested in the U.S., and U.S. manufacturers use bromides in the manufacturing process as a fire

retardant which may interfere with long-term performance. Asphalt-based roofing material should be covered with high-density polyethylene membrane to prevent roots and other organisms from utilizing the organic asphalt as an energy source (Scholtz-Barth, 2001). Some membranes are not compatible with asphalt-based or other roofing materials. Follow manufacturer's recommendations for material compatibility.

The *drain layer* consists of either aggregate and/or a manufactured material that provides channels designed to transmit water at a specific rate. This layer can include a separation fabric, which with the drainage layer, reduces moisture contact with the waterproof membrane and provides additional protection from root penetration (Peck et al., n.d.).

The light-weight growth medium is designed to support plants and infiltrate and store water at a specific rate. The growth medium typically has a high mineral to organic material content and can be a mixture of various components including: gravel, sand, crushed brick, pumice, perlite, encapsulated Styrofoam, compost, and soil (Peck et al., n.d.). Saturated loads of 15 to 50 pounds/square foot are typical for extensive roofs with 1- to 5-inch soil depths (Scholtz-Barth, 2001). Currently, vegetated roofs weighing 15 pounds/square foot (comparable to typical gravel ballast roofs) have been installed and are functioning in the U.S. At 15 to 50 pounds, many roofs can be retrofitted with no or minimal reinforcement. Separating the growth medium from the building perimeter and roof penetrations with a non-combustible material (e.g., gravel) can provide increased protection against spread of fire, easier access to flashing and membrane connections, and additional protection from root penetration (Peck et al., n.d.).

Vegetation is typically succulents, grass, herbs, and/or wildflowers adapted to harsh conditions (minimal soils, seasonal drought, high winds, and strong sun exposure—i.e., alpine conditions) prevalent on rooftops. Plants should be adapted or native to the installation area. Some examples of species include: sempervivum, sedum, creeping thyme, allium, phloxes, and anntenaria. (Scholtz-Barth, 2001). Plants can be installed as vegetated mats, individual plugs, spread as cuttings, or by seeding. Vegetated mats and plugs provide the most rapid establishment for sedums. Cuttings spread over the substrate are slower to establish and will likely have a high mortality rate; however, this is a good method for increasing plant coverage on a roof that is in the process of establishing a plant community (Scholtz-Barth, 2001). During the plant establishment period soil erosion can be reduced by using a biodegradable mesh blanket.

# A bonus for eco-roofs

The city of Portland encourages the application of eco-roofs in the central city to reduce stormwater runoff. Buildings using ecoroofs can earn bonus floor area (exceeding maximum floor area ratios) depending on the extent of coverage. For example, if the total area of the eco-roof is at least 60 percent of the building's footprint, each square foot of eco-roof earns three square feet of additional floor area.

# Flow modeling guidance

See Chapter 7 for flow modeling guidelines for vegetated roofs when using WWHM.

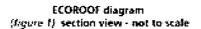
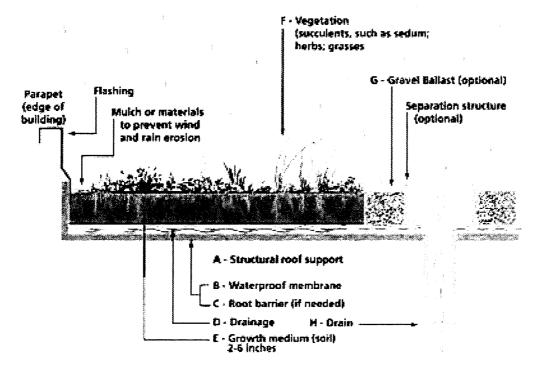


Figure 6.4.2 Cross section of vegetated roof garden.
© Environmental Services, Portland, Oregon



For a sample vegetated roof specification, see Appendix 9.

#### 6.4.3 Maintenance

Proper maintenance and operation are essential to ensure that designed performance and benefits continue over the full life cycle of the installation. Each roof garden installation will have specific design, operation, and maintenance guidelines provided by the manufacturer and installer. The following guidelines provide a general set of standards for prolonged roof garden performance. Note that some maintenance recommendations are different for extensive versus intensive roof gardens. The procedures outlined below are focused on extensive roof systems and different procedures for intensive roof recommendations are noted.

#### Schedule

- All facility components, including structural components, waterproofing, drainage layers, soil substrate, vegetation, and drains should be inspected for proper operation throughout the life of the roof garden.
- The property owner should provide the maintenance and operation plan, and inspection schedule.
- All elements should be inspected twice annually for extensive installations and four times annually for intensive installations.
- The facility owner should keep a maintenance log recording inspection dates, observations, and activities.
- Inspections should be scheduled to coincide with maintenance operations and with important horticultural cycles (e.g., prior to major weed varieties dispersing seeds).

#### Structural and drainage components

- Structural and drainage components should be maintained according to manufacturer's requirements and accepted engineering practices.
- Drain inlets should provide unrestricted stormwater flow from the drainage layer to the roof drain system unless the assembly is specifically designed to impound water as part of an irrigation or stormwater management program:
  - Clear the inlet pipe of soil substrate, vegetation or other debris that may obstruct free drainage of the pipe. Sources of sediment or debris should be identified and corrected.
  - o Inspect drain pipe inlet for cracks, settling and proper alignment, and correct and re-compact soils or fill material surrounding pipe if necessary.
- If part of the roof design, inspect fire ventilation points for proper operation.

#### **Vegetation Management**

- The vegetation management program should establish and maintain a minimum of 90 percent plant coverage on the soil substrate.
- During regularly scheduled inspections and maintenance, bare areas should be filled in with manufacturer recommended plant species to maintain the required plant coverage.
- Normally, dead plant material will be recycled on the roof; however specific
  plants or aesthetic considerations may warrant removing and replacing dead
  material (see manufacturer's recommendations).
- Invasive or nuisance plants should be removed regularly and not allowed to
  accumulate and exclude planted species. At a minimum, schedule weeding with
  inspections to coincide with important horticultural cycles (e.g., prior to major
  weed varieties dispersing seeds).
- Weeding should be done manually and without herbicide applications.
- Extensive roof gardens should be designed to not require fertilization after plant
  establishment. If fertilization is necessary during plant establishment or for plant
  health and survivability after establishment, use an encapsulated, slow release
  fertilizer (excessive fertilization can contribute to increased nutrient loads in the
  stormwater system and receiving waters).
- Intensive green roofs installations require fertilization. Follow manufacturer and installer recommendations.
- Avoid application of mulch on extensive roof gardens. Mulch should be used
  only in unusual situations and according to the roof garden provider guidelines.
  In conventional landscaping mulch enhances moisture retention; however,
  moisture control on a vegetated roof should be through proper soil/growth
  media design. Mulch will also increase establishment of weeds.

#### Irrigation

- Surface irrigation systems on extensive roof gardens can promote weed
  establishment and root development near the drier surface layer of the soil
  substrate, and increase plant dependence on irrigation. Accordingly, subsurface
  irrigation methods are preferred. If surface irrigation is the only method
  available, use drip irrigation to deliver water to the base of the plant.
- Extensive roof gardens should be watered only when absolutely necessary for plant survival. When watering is necessary (i.e., during early plant

establishment and drought periods), saturate to the base of the soil substrate (typically 30 to 50 gallons per 100 square feet) and allow the soil to dry completely.

#### **Operation and Maintenance Agreements**

 Written guidance and/or training for operating and maintaining roof gardens should be provided along with the operation and maintenance agreement to all property owners and tenants.

#### Contaminants

- Measures should be taken to prevent the possible release of pollutants to the roof garden from mechanical systems or maintenance activities on mechanical systems.
- Any cause of pollutant release should be corrected as soon as identified and the pollutant removed.

#### Insects

- Roof garden design should provide drainage rates that do not allow pooling of
  water for periods that promote insect larvae development. If standing water is
  present for extended periods, correct drainage problem.
- Chemical sprays should not be used.

#### **Access and Safety**

• Egress and ingress routes should be clear of obstructions and maintained to design standards.

(City of Portland, 2002 and personal communication, Charlie Miller, February 2004)

#### 6.4.4 Cost

Costs for vegetated roofs can vary significantly due to several factors including size of installation, complexity of system, growth media depth, and engineering requirements. Costs for new construction including structural support range from \$10 to \$15 per square foot. Retrofit costs range from \$15 to \$25 per square foot (Portland Bureau of Environmental Services, 2002). While initial installation costs are higher than for conventional roof systems, they are competitive on a full life cycle basis. Vegetated roofs increase the energy efficiency of a building and significantly reduce associated cooling and heating costs. European evidence indicates that a correctly installed green roof can last twice as long as a conventional roof, thereby deferring maintenance and replacement costs (Peck et al., n.d.). The above costs do not include savings on conventional stormwater management infrastructure as a result of reduced flows from a green roof or reduced stormwater utility fees.

#### 6.4.5 Performance

Vegetated roof designs require careful attention to the interaction between the different components of the system. **Saturated hydraulic conductivity**, porosity and moisture retention of the growth media, and **transmissivity** of the drainage layer strongly influence hydrologic performance and reliability of the design (Miller and Pyke, 1999).

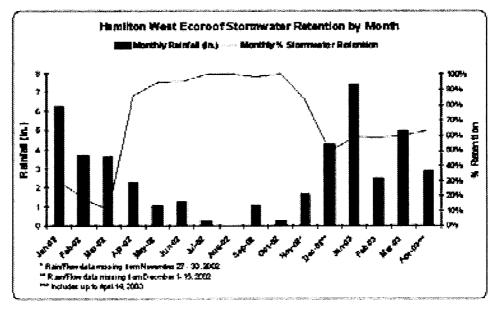
Research in Europe, in climates similar to the northeastern U.S., has consistently indicated that roof gardens can reduce up to 50 percent of the annual rooftop

European research, in climates similar to the northeastern U.S., has consistently indicated that roof gardens can reduce up to 50 percent of the annual rooftop stormwater runoff. stormwater runoff (Miller and Pyke, 1999). During a 9-month pilot test in eastern Pennsylvania, 14 and 28 square foot trays with test vegetated roof sections received a total of 44 inches of precipitation and generated 15.5 inches of runoff (runoff was negligible for storm events producing less than 0.6 inches of rainfall). The pilot section was 2.74 inches thick, including the drainage layer (USEPA, 2000b).

In Portland Oregon, a 4- to 4.5-inch eco-roof retained 69 percent of the total rainfall during a 15-month monitoring period.

In the first January-to-March period (2002), rainfall retention was 20 percent and during the January-to-March (2003) period retention increased to 59 percent. The most important factors likely influencing the different retention rates are vegetation and substrate maturity, and rainfall distribution. The 2002 period was a more even rainfall distribution and the 2003 period more varied with longer dry periods between storms (Hutchison, Abrams, Retzlaff and Liptan, 2003). This supports observations by other researchers that vegetated roofs are likely more effective for controlling brief (including relatively intense) events compared to long-duration storms (Miller, 2002).

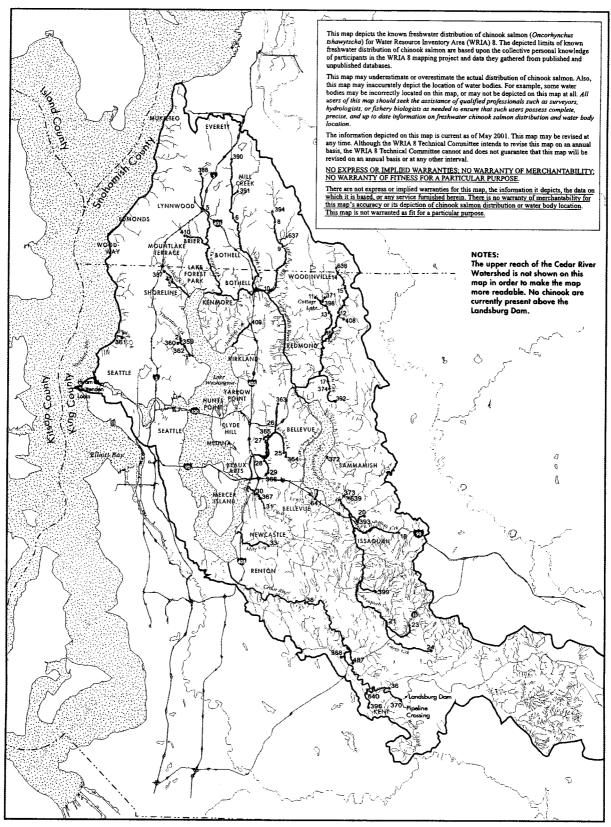
Figure 6.4.3 Precipitation and percent stormwater retained on a 4- to 4.5-inch eco-roof, Portland, OR. Graphic from Hutchison et al., 2003



## 6.5 Minimal Excavation Foundation Systems

Excavation and movement of heavy equipment during construction compacts and degrades the infiltration and storage capacity of soils. Minimal excavation foundation systems limit soil disturbance and allow storm flows to more closely approximate natural shallow subsurface flow paths. When properly dispersed into the soils adjacent to and in some cases under the foundation, roof runoff that would otherwise be directed to bioretention areas or other LID facilities can be significantly reduced.

Minimal excavation foundation systems can take many forms, but in essence are a combination of driven piles and a connection component at, or above, grade. The piles allow the foundation system to reach or engage deep load-bearing soils without having to dig out and disrupt upper soil layers, which infiltrate, store and filter stormwater flows. These piles are a more "surgical" approach to earth engineering, and may be vertical, screw-augured or angled pairs that can be made of corrosion protected steel, wood or concrete. The connection component handles



# Known Freshwater Distribution of Chinook Salmon for Water Resource Inventory Area (WRIA) 8

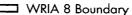
#### **Chinook Distribution - Streams**

- Present First Hand Information
- Present Second Hand Information

#### **Chinook Distribution - Lakes**

Present

Odta Point and Number
(CLICK HERE to see data table for a description of each point.)



Major Road

Stream

KING

Map Produced by:
GIS & Visual Communications Unit, WLR
File Name: 0105ChinookDistMap.eps md,lp,sk

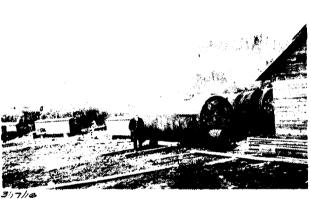
Revised May 2001

## Quendall Terminals

Environmental Cleanup Habitat Restoration

Economic and Waterfront Sustainable Development

# Timeline: Creasote Manufacturing Stonge 1900s 1970 1970 2000 2006 2009 2012 20?? Current ownership acquires site and postal environmental testing and analysis studies site wife studies.



Quendall

**Terminals** 









For More Information:
Visit us at www.quendallterminals.com
Or Contact:
Campbell Methewson
Certury Parific, LLIP
205-757-8890

A 22-acre former industrial property located on the southeast shore of Lake Washington could become a model for environmental cleanup, habitat restoration, recreation and economic development.

The Quendall Terminals site in Renton, WA presents the challenges and opportunities for conversion of a highly contaminated former industrial creosote manufacturing plant into a thriving commercial development.

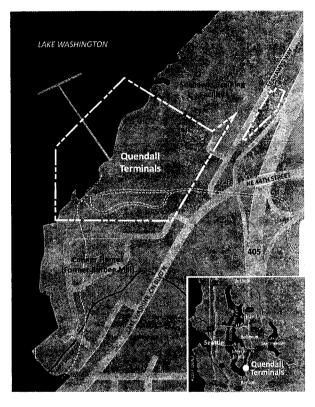


As the largest undeveloped parcel of shoreline on Lake Washington, the property needs to be cleaned up not only for

future development but for the enhancement of habitat and the recovery of natural resources.

The owners and regulators have been working diligently and cooperatively to identify an appropriate remedy. The ability of the owners to accomplish a remedy will depend on whether the cleanup and habitat restoration can be completed in a reasonable time and at a reasonable cost. The opportunities to remove historical contamination, provide economic development, local jobs, more public access and improved habitat are what make the property valuable—not only to prospective owners but to the community at large.





#### The Vision:

- Cleanup of soil and groundwater from a century of industrial use addressing potential threats to human health and the environment
- Nearly three acres of open space with public access for trails and interpretive
   violenteits.
- · Improved habitat for salmon and other threatened species
- Jobs from cleanup, construction and future use of a now vacant hole in Renton's waterfront
- · Increased tax revenues for Renton and King County
- Completion of cleanup and redevelopment of the last remaining large parcel of property on Lake Washington



# **Quendall Terminals**

Environmental Cleanup

Habitat Restoration

#### Economic and Waterfront Sustainable Development

2012

#### The Time for Action:

More than \$7.3 million has been spent by the current property owners to study and cleanup historical contamination over the past 25 years.

Without an opportunity for redevelopment, funds to pay for the cleanup will not be readily available to the property owners.

A reasonable, timely, environmentally protective and cost effective cleanup can be achieved when approved by the U.S. Environmental Protection Agency (EPA).

#### Site History:



In the early 1900s sludge and waste from Seattle's gas-from-coal operations on Lake Union and other sources were offloaded at the site for use in creosote manufacturing. Decades of industrial use continued until two local families purchased the area in the 1971. A log yard and other operations continued until 2001.

Environmental studies and early cleanups were conducted under the authority of the Washington Department of Ecology until 2006 when the site was listed on the federal Superfund project list. The U.S. Environmental Protection Agency is now overseeing the cleanup efforts.

In September 2006, Altino Properties and J. H. Baxter & Company, two of the site's potentially responsible parties,

entered into an Administrative Order on Consent (AOC) with EPA. The AOC requires the potentially responsible parties to complete a remedial investigation and feasibility study



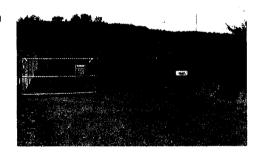
(RI/FS). Based on the RI/FS EPA will propose a preferred cleanup remedy, and after seeking public comment will select a final cleanup remedy.

#### Cleanup:

Cleanup will likely involve technologies to remove or treat contamination in soil, groundwater and the nearshore lake sediments. An extensive restoration plan would re-establish and expand wetland areas and increase riparian habitat at the shoreline.









#### Future Development:

The plans for redevelopment of the Quendall Terminals property are consistent with the City of Renton's comprehensive plan and zoning. The preferred alternative includes:

- Multi-family housing (692 units)
- Retail space (21,600 sq. ft)
- Restaurant space (9,000 sq. ft)
- Parking (2,200 spaces)
- Improved transit and bike access
- Local road improvements from I-405



Building NW 2 Building NW 1

Partial West Elevation from Lake Washington



Building NW 1
Partial South Elevation

#### Neighborhood and Community Benefits:

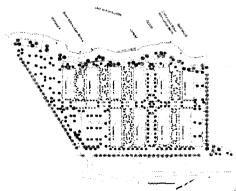
- · Contamination cleaned up
- More open space near Lake Washington
- Economic activity, tax revenue and increased property values
- Well-managed transportation
- Increased habitat and environmental restoration



West View from Central Roundabout



East View from Lake Washington







## **Quendall Terminals**

Environmental Cleanup

- Rabital Resta alika

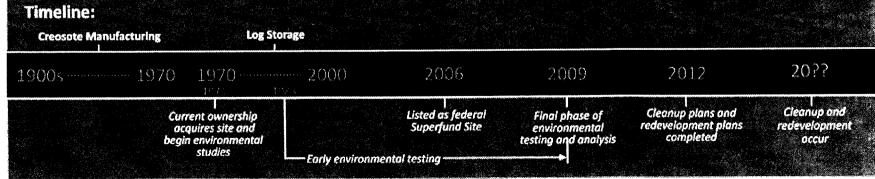
HOME SITE HISTORY FUTURE DEVELOPMENT CLEANUP CONTACT

#### SITE HISTORY

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# **Quendall Terminals**

## Environmental Cleanup

Habital Restoration

HOME SITE HISTORY FUTURE DEVELOPMENT CLEANUP CONTACT

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- Economic activity, tax revenue and increased property values
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- Increased habitat and environmental restoration



West View from Central Roundabout



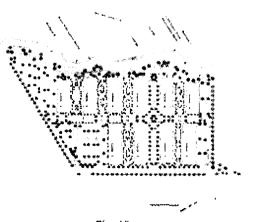
East View from Lake Washinaton



Partail West Elevation from Lake Washington

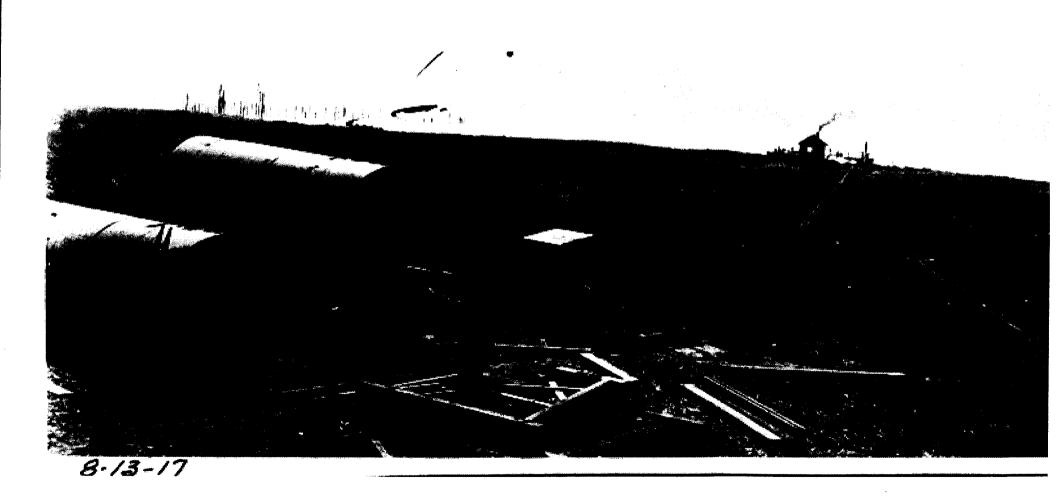


हाज्यान्त्र घरणः। Partail South Elevation

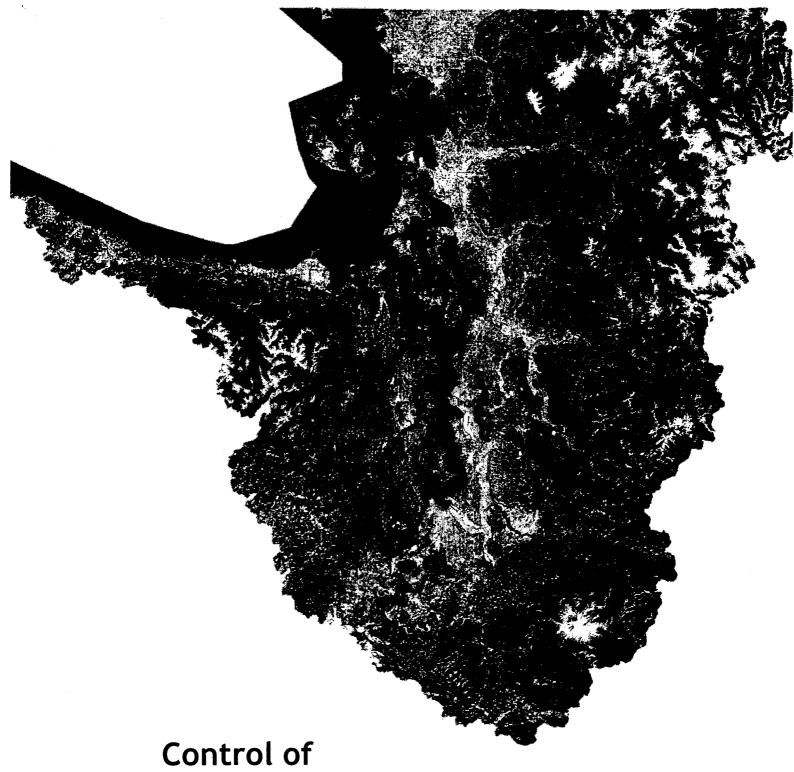


Plan View









Control of
Toxic Chemicals in Puget Sound
Phase 3 Data and Load Estimates

Publication No. 11-03-010

# **Conclusions**

This report summarizes results from the Phase 3 study of toxics in surface runoff in the Puget Sound basin. The objectives of this study were to (1) refine previous estimates of contaminant load contributions to Puget Sound from surface runoff by monitoring contaminant concentrations and discharge in small streams from four land-use categories (commercial/industrial, residential, agricultural, and forest) and (2) calculate the relative contributions of toxic chemicals from the four land-use types.

From August 2009 through July 2010, samples were collected during six storm conditions and two baseflow conditions from 16 streams in the Puyallup and Snohomish watersheds. Each stream received surface runoff primarily originating from one of the four land uses. Samples were analyzed for conventional water quality parameters, heavy metals, and an extensive list of organic compounds. The specific analyses performed on these data included:

- Computation of summary statistics.
- Principal component analysis.
- Computation of loading estimates at the subbasin scale.
- Computation of loading estimates at the watershed scale.
- Computation of loading estimates at the Puget Sound-basin scale.

Based on these analyses, major conclusions from this study are presented below.

- Despite some limitations on the accuracy of the compiled data, this study provided a high quality dataset for generating improved toxic chemical load estimates in surface runoff in the Puget Sound ecosystem. Unlike the previous Phase 1 and Phase 2 studies, the data from this study were obtained from actual field sampling in representative subbasins for each land use using analytical methods that provided very low detection limits. The data were also subject to a rigorous quality assurance review process to ensure they are of a known and acceptable quality.
- Whenever possible, potential sources of error in the loading estimates were quantified based on analyses of compiled quality assurance data from the study. These data generally show that uncertainty in the loading estimates that stems from flow measurement error ranges from approximately 12 to 50 percent. Potential uncertainty in the water quality data from sampling and analysis error averaged 14 percent for all parameters but PCBs and PBDEs. Errors in congeners averaged 40 and 29 percent, respectively, although 52 percent of results were very close to the reporting limit. Overall variability in the loading estimates that stems from uncertainty in the water quality data was also quantified by reporting the 25th and 75th percentile load estimates that were derived using the 25th and 75th percentile concentrations for each parameter. The error reflected in the range between these values is typically several orders of magnitude. Despite this large error, the resultant data from this study are, in the majority of cases, consistent with previous studies.
- Consistent with other regional studies (e.g., Herrera 2004, 2007), concentrations of many parameters (e.g., metals) were higher during storm events in comparison to baseflow for each of the land-use types. This pattern was especially evident in the data collected from the

- commercial/industrial and residential subbasins. Dissolved arsenic was an exception and also tended to be elevated during baseflow across all the land-use types.
- Although this study was not explicitly designed to examine seasonal first-flush dynamics, results from the fall storm indicated higher detection frequencies and concentrations than in winter or spring storm events. In particular, oil and grease, TPH (lube oil), and triclopyr were detected more frequently and at higher concentrations in samples collected during the fall storm relative to subsequent storm events. This pattern was generally observed for each of these parameters in the data from all the land-use types except forests.
- This study did not specifically evaluate adverse impacts to sensitive organisms in streams and other water bodies that receive direct runoff from each land-use type. However, stormwater runoff, particularly from commercial/industrial subbasins, did not meet water quality criteria or human health criteria for several parameters. These include dissolved copper, lead, and zinc; total mercury; bis(2-ethylhexyl) phthalate; and carcinogenic PAHs. However, no numeric criteria have been developed for most parameters analyzed in this study, and the lack of exceedances does not necessarily mean that the levels are safe for aquatic life or human health.
- This study indicated that commercial/industrial subbasins export, in many cases, an order
  of magnitude higher concentration of organic chemicals than other land-use types.
  Commercial/industrial, agricultural, and residential (in that order) land uses have
  substantially elevated levels of metals concentrations and unit loadings as compared to
  forested lands.
- This study indicated that the majority of the total contaminant loading to Puget Sound is derived from very low-level concentrations in forested subbasins and from somewhat higher concentrations in residential subbasins. Total loading to Puget Sound is a concern for those contaminants that bioaccumulate or cycle within receiving waters and lead to persistent degraded conditions.
- Total contaminant load to Puget Sound is not the only scale of importance. Given that the
  highest contaminant concentrations and unit-area loads were found in stormwater from the
  most highly developed land uses, controls may be needed to address contaminant levels that
  could be found in small streams in the urban corridor.
- While the study was designed to minimize bias, several factors may have produced overestimates or underestimates of loads at various scales. Factors possibly leading to overestimates include instream processes and selection of forested basins close to population centers. Factors possibly leading to underestimates include land cover heterogeneity particularly for commercial/industrial, residential characterized low-density only, use of stream data to characterize lands discharging through conveyance systems, and undersampling fall storms. Other factors could produce either overestimates or underestimates, including use of grab samples, legacy contaminants, and the much smaller proportion of forested lands in the Puget Sound watershed characterized by the four forested subbasins.
- While instream data were used to estimate loads by different land uses and at different spatial scales, these data may not represent stormwater that discharges to marine waters or near marine waters. Conveyance system data may be more appropriate; however, this study did not distinguish loads in these areas.

•	Approximately 139 parameters out of the 368 evaluated were not detected in any of the collected samples despite the very low detection limits that were achieved for this study. Many of these same parameters were also not detected in other regional studies (e.g., Herrera 2007) of toxics loading in surface runoff. These parameters are unlikely to be detected in any future instream monitoring given reporting limits that can be achieved with existing analytical methods.

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Page 88

# Recommendations

Based on these study conclusions, the following recommendations are offered:

# **Management Needs**

• Using the data obtained from this study, management actions should be developed to target specific toxic chemicals at the appropriate scale. For example, this study indicated that the majority of the total chemical loading to Puget Sound is derived from very low-level concentrations in forested subbasins and from somewhat higher concentrations in residential subbasins. Low-level loading to Puget Sound is a concern for those toxic chemicals that bioaccumulate or cycle within receiving waters and lead to persistent degraded conditions or are known to impact marine organisms at low concentrations (Puget Sound Partnership 2006).

To be effective, management strategies for controlling toxic chemical loadings to Puget Sound must be broadly applied across forest and other land uses. Given that it may be difficult to reduce the low concentrations in runoff from these areas using conventional stormwater treatment practices (Schueler 1996), source prevention (e.g., emission controls, removing toxics from consumer products) may be the most effective control measure for parameters where Puget Sound-scale loads are of concern.

• Targeted management actions should be identified for specific land-use types with high unitarea loading rates of toxic chemicals (e.g., commercial/industrial) to reduce their associated acute and chronic toxicity in adjacent streams and other water bodies. Given the relatively high concentrations in runoff from these areas and the relatively small geographic areas they occupy, effective treatment options are generally available for reducing the export of toxic chemicals from these areas (Barrett 2005; Davis et al. 2009; Dietz 2007; Geosyntec and Wright Water 2008). This would include retrofitting treatment systems in existing development (USGS 2010) and low-impact development techniques in new development of previously undeveloped lands (Pennington et al. 2003).

# **Data and Analytical Needs**

- Additional monitoring of toxic chemicals in surface runoff should be performed to address
  data gaps that were identified through this study. This would include further characterizing
  any seasonal first-flush dynamics for toxic chemicals in surface runoff, toxic chemical
  transport on the water surface and/or within the alluvium where the well-mixed assumption
  may not hold, and toxic chemical transport in association with large events.
- The study relied on the use of multiple grab samples to optimize resources. However, future studies should consider in-situ equipment to quantify within-storm variations in contaminant concentration and the associated loads.
- A sample size power analysis should evaluate the extensive dataset compiled in this study and quantify sampling program needs to further reduce uncertainty for specific parameters of interest.

- Supplemental sampling could be conducted for parameters that exhibited large variability
  among different subbasins within a given land use. More forested basins may be necessary
  to adequately characterize those land-use contributions for contaminants that persist or
  bioaccumulate, for example.
- Given that the residential sites selected in the stratified random-study design were entirely low-density residential, future studies should consider quantifying the full spectrum of residential land-cover intensity.
- If the total load of a given parameter to Puget Sound needs more precise quantification due to potential impacts, then additional characterization of forested lands may be warranted. Sampling sites were limited to forested lands below 2,200 feet in elevation to optimize sampling logistics and to avoid complications of snowmelt. Future studies could further stratify the forested lands by elevation or other factors.
- In addition, because stream and river processes may affect the delivery of contaminant loads generated by forested or other land covers, an understanding of how these processes affect particular parameters of concern may be warranted. These processes may mitigate loads delivered to Puget Sound but could be responsible for retaining contaminants in sensitive freshwater bodies where biota and human impacts are still possible.
- The hydrologic monitoring data were not evaluated in detail, but several patterns suggest land cover influences. Understanding patterns between hydrologic responses and pollutant loads could inform future stormwater management.
- Decisions about parameters to include in future studies in the region should consider the fact
  that many of the parameters identified in Appendix E will likely not be found unless
  substantially lower analytical detection limits are employed or unless sampling occurs closer
  to the point of generation where dilution is minimal. Reducing the parameter list could lead
  to potential cost savings in future monitoring efforts without compromising scientific rigor.
- Stormwater conveyance system data currently being collected by permittees should be compiled and analyzed in a Puget Sound context. For some areas, conveyance system data may be more appropriate to characterize loads. Future load estimates should consider this dataset.

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Page 96

# Roofing Materials' Contributions to Storm-Water Runoff Pollution

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Abstract: Development in sensitive watersheds continues to pose environmental problems for receiving waters. One contributor to this long-term pollution is building and other construction materials. However, the long-term effect of many building materials on the environment has not been quantified due to limited testing of these materials prior to sales and installation. Laboratory "leach" testing of commercially available roofing materials by this research group indicated that the potential for release (primarily nutrients, lighter hydrocarbons, pesticides, and metals) is substantial. Testing of metals' release from aged roofing panels also has shown that the potential for pollutant release still exists after 60 years. The data missing from a complete evaluation of many roofing materials is behavior over the lifespan of the material, including the critical period of initial exposure. The 2 years of runoff data from a pilot-scale testing of these materials indicated substantial concerns regarding zinc from uncoated galvanized metals and copper from treated woods in this early part of the materials' lifespan, plus the potential for long-term nutrient releases in the runoff from several roofing types.

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#### Introduction

Urban runoff has been identified as a major contributor to the degradation of many urban streams, rivers, and estuaries (Burton and Pitt 2002, which includes an extensive literature review). Using the Microtox acute toxicity testing procedure, Pitt et al. (1995) investigated the toxicity of source-specific urban wet

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weather flows. Roofs, storage areas, streets, and loading docks had the highest frequency of moderately toxic and highly toxic runoff samples. Runoff from roofs and paved surfaces had the greatest organic toxicant detection frequencies and the highest levels of detected metals. Boller (1997) found roof runoff to contain not only heavy metals, but polycyclic aromatic hydrocarbons (PAHs) and organic halogens as well. In addition to the well known component materials in roofing and pavements, seemingly unrelated compounds have been added to improve performance and durability, and these compounds could be the source of many pollutants detected in the runoff.

Based on a review of the literature, other building materials of concern included concrete, paints, and exposed wood/pressure treated wood. A summary of the literature on concrete and asphalt paving can be found in Clark et al. (2002). For paint, the concerns reported were lead and other metals incorporated into the paint itself (Davis and Burns 1999). In New Zealand, limits were placed on the heavy metal content of paints applied to metal construction materials, such as roofs, as an environmental barrier (Kingette Mitchell Ltd. and Diffuse Sources Ltd. 2003). This use of paint as an environmental barrier was, for example, a practice that occurred on a site in the western United States to reduce the zinc release from galvanized metal roofing.

A summary of the literature on roofing (both surface covers and materials used as subbases such as treated wood) is presented in Table 1. The older field studies in the table inferred the differences in roofing's pollutant contributions by analyzing runoff from nearby roofs made from different materials, using small areas where atmospheric contributions could be assumed to be similar. Newer studies directly or indirectly measured atmospheric contributions in order to isolate the materials' contributions. In addition to the research projects that reported runoff concentrations, others investigated the effects of these materials

Table 1. Roof Runoff Analysis—Literature Summary

Roof type	Location	Analytes Cu (μg/L)	Zn (µg/L)	Pb (μg/L)	Cd (μg/L)	As (μg/L)	рН	NH <sub>4</sub> <sup>+</sup> (mg/L)	NO <sub>3</sub> (mg/L)	Reference
Polyester	Duebendorf, Switzerland	6,817	2,076	510	3.1					Boller (1997)
Tile		1,905	360	172	2.1					(2,7,7,7
Flat gravel		140	36	22	0.2					
Plywood w/ roof paper/tar	Washington	166 <sup>T</sup> /128 <sup>D</sup>	877 <sup>T</sup> /909 <sup>D</sup>	$11^{T}/<5^{D}$			4.3			Good (1993)
Rusty galv. metal							5.9			G00a (1773)
							4.8			
Old metal w/Al paint		$20^{\mathrm{T}}/2^{\mathrm{D}}$	$12,200^{\mathrm{T}}/11,900^{\mathrm{D}}$	302 <sup>T</sup> /35 <sup>D</sup>			4.1			
Flat tar surface w/fibrous reflective Al paint		$11^{\mathrm{T}}/7^{\mathrm{D}}$	1,980 <sup>T</sup> /1,610 <sup>D</sup>	$10^{T}/ < 5^{D}$			5.9			
New anodized Al		$25^T/14^D$	$297^{\mathrm{T}}/257^{\mathrm{D}}$	$10^{T}/5^{D}$						
		$16^{\mathrm{T}}/7^{\mathrm{D}}$	101 <sup>T</sup> /82 <sup>D</sup>	$15^{T}/ < 5^{D}$						
Zinc-galv. Fe	Dunedin City, New Zealand	560 µg/g	5,901 μg/g	670 µg/g						Brown and Peake (2006)
Fe-Zn sheets	lle-Ife, Nigeria						6.77	0.06	1.52	Adeniyi and Olabanji (2005)
Concrete slate tiles							7.45	0.05	3.34	, , , , , ,
Asbestos cement sheets							7.09	0.06	2.26	
Aluminum sheets							6.68	0.05	6.18	
Cu panels	Munich, Germany	200–11.100					6.7–7.0			Athanasiadis et al. (2006)
Galvanized metals (primarily Galvalume)	Seattle, Wash.	10–1,400	420-14,700	ND						Tobiason et al. (2004)
CCA wood	Florida					1,200–1,800				Khan et al. (2006)
Untreated wood						2–3				(-2-5)

on receiving waters and biota. Bailey et al. (1999) investigated the toxicity to juvenile rainbow trout of runoff from British Columbia sawmills and found that much of the toxicity may have been a result of divalent cations, in particular, zinc from galvanized roofs. Other sources of toxicity included tannins and lignins from the woods. Lebow et al. (1999) tested chromated-copperarsenate (CCA) treated wood in seawater and deionized water and found that the steady-state release rate of copper was much greater in seawater than in deionized water (vice versa for arsenic). Seawater testing may be indicative of material behavior when exposed to salt-laced rainwater in the winter.

Stormwater runoff in a ditch water near pentachlorophenol (PCP) treated utility poles had chlorophenol concentrations 1.8 times the 96-h  $LC_{50}$  (lethal concentration for 50% of the salmonid test organisms) (Stranks 1976). As these studies showed, preservative release during storms from CCA and other preserved woods was sufficiently high to be implicated in these toxicity studies. These materials, therefore, have to be of concern in the environment since they are used as subbase for roofing, as eaves or, in the case of cedar, as a roofing material itself.

Wallinder et al. (2007) and Van Assche et al. (2003) modeled worldwide copper and zinc runoff rates, respectively, based on runoff rates and concentrations reported in the literature, in addition to laboratory testing on degradation. These results, in combination with the runoff concentrations reported in Table 1, indicated that roofing has the potential to be a significant pollutant source in the urban environment, where roofing covers a substantial fraction of the landscape.

What cannot be determined from the prior roofing runoff studies and the Table 1 results is the contribution to toxicity and runoff pollutant concentrations from the various roofing materials themselves versus contributions from atmospheric deposition. The literature very strongly suggests that these materials contribute to increased runoff pollutant concentrations. This is evident especially when nearby roofs of different compositions produce vastly different runoff concentrations. To address the concerns about pollutant release in the field from common construction materials, laboratory "leaching" studies (Pitt et al. 1999; Clark 2000) were performed. The results indicated that the potential existed for many construction materials to release pollutants into the environment. Concerns about the environmental impacts of roofing led to the development of newer materials. However, these newer materials do not have readily available results showing both their short-term and long-term pollutant contributions to urban runoff.

This ongoing research project examined a variety of roofing materials (including subbase materials such as treated and untreated woods and roofing felts, which may be exposed both during roof installation and after damage to the roof) to determine their long-term pollutant release after typical installation and exposure to the weather. The goal was to develop a better understanding of how aging and exposure processes impacted the temporal release of pollutants to runoff which, eventually, should translate into a model of pollutant release over the material's life cycle.

#### Methodology

This research consisted of two parts: (1) a laboratory leaching study of test coupons (including a simulated runoff event on aged roofing sections, described below); and (2) a 2-year (to date), pilot-scale field study in Pennsylvania. The project focused on

roofing and subbase materials commonly used in the roofing industry. The categories of materials investigated during the laboratory-scale survey included the following:

- Roofing materials (galvanized metal, asphalt/tar shingles, cedar shingles, plastic/vinyl/fiberglass roofing panels, fake slate roofing, and roofing sealers); and
- 2. Woods [one  $(2 \times 4)$  treated with CCA, another  $(2 \times 4)$  with an alternative waterproofing compound (modified copper combination), and one untreated wood].

The materials, with two exceptions, were purchased from Lowes Home Improvement Stores in Birmingham, Ala., for the laboratory studies, and in Harrisburg, Pa., for the field studies. The aged metal roofing panels (~60 years old), used in laboratory studies only, were obtained from a barn in Lancaster County, Pa. One panel was on the roof for the entire time and was rusted. The second panel was stored in the barn as a replacement and still had its paint intact. Besides the paint, which likely contained lead, it was unknown whether the panels were subjected to other coating treatments like zinc oxide. The appearance of the panels was similar to galvanized metal. The results from testing these older materials guided the experimental design for the field studies, particularly in terms of monitoring program length.

#### Laboratory "Leaching" Studies

The laboratory tests were performed in 2002 using a modified toxicity characteristic leaching procedure (TCLP) test. This test simulated the exposure of a material or waste to acidic environmental conditions. The two modifications to the USEPAprescribed test were the weight of material (approximately 100-200 g) and the length of exposure [48 h for these tests, using Leachant Solution I—the more aggressive, lower pH leachant. The pH of Leachant 1 was approximately 0.5 pH units lower than the acidic rainwater measured at the Penn State Harrisburg (PSH) site]. The resulting leachate for each material (triplicate samples for each material) was analyzed for the following constituents: pH, conductivity, chemical oxygen demand (COD), semivolatile organics, pesticides, heavy metals, major cations, and nutrients. The analytical methodologies were described in Clark et al. (2005) and conformed to methods outlined by EPA or Standard Methods (APHA 1995). The aged roofing panels were analyzed in 2004 using the "leaching" protocols described above, as well as being subjected to a synthetic rainfall applied with a spray bottle over the surface of the material. The formula for the simulated rainwater was from Davis and Burns (1999). The runoff and the original rainwater were analyzed using EPA Method 200.9, with the rainwater concentrations subtracted from the runoff results to obtain the contributions from the materials themselves. For these panels, heavy metals were the only pollutants of interest.

# Pilot-Scale Field Testing

Two sites in the eastern United States were selected for the field tests based on climatic differences: the southern site was at the University of Alabama-Birmingham (UAB), while the mid-Atlantic site was at PSH. These two sites occur in two EPA rainfall zones (PSH: Zone 1; UAB: Zone 3) and two different rainfall pH zones (from USGS data, PSH: 4.3—4.5; UAB: >4.8). The roofing materials (whole panels: 1.22 m×2.44 m, shingles attached in sheet rows as prescribed by the manufacturer) were attached to A frames, with slopes similar to those used in residential pitched roofs (Fig. 1 shows the test setup at PSH). Construction was completed and testing began at PSH in the summer of



Fig. 1. Roofing setup at PSH field site

2005. At UAB, roofing panels and frames were reconstructed in the spring of 2007 as a result of prior hurricane damage. The test panels were placed on each campus in areas with no overhead canopy to obstruct rainfall onto the panels. Installation techniques and fasteners, including spacing of fasteners, matched those used by roofers to the maximum extent practicable. The panels were left covered until just before the first monitored rain event. The field results portion of this paper focused on the PSH site data since the UAB evaluation recently was restarted. For the PSH site, samples were collected for every storm for the first 2 months, with periodic sampling thereafter.

The field testing evaluated the following materials (manufacturer information provided where available from the store):

- Plexiglass (as a control to quantify and background subtract atmospheric deposition);
- Plytanium plywood [untreated and pressure-treated (CCA)];
- Severe-weather pressure treated/water sealed planks;
- Cedar shakes;
- Roofing felt/tar paper—30 lb. (United Roofing Mfg.);
- Asphalt fiberglass shingles (Supreme Owens Corning 3-tab [25-year limited warranty] treated for 10-year algae resistance):
- Rubberized roofing material (similar to the layer on a built-up roof);
- Galvanized aluminum, corrugated;
- 55% aluminum-zinc alloy coated steel (Galvalume) prepainted;
- Asphalt impregnated organic fiber panel (Ondura 2002), corrugated; and
- · Polyvinyl chloride panel, corrugated.

Analytes included pH (including periodic direct measurement of rainfall by pH meter in beaker of rainfall collected during a storm; the pH was measured as soon as sufficient rainwater was collected to submerge the probe tip), specific conductance, COD, nutrients, and heavy metals. These parameters were analyzed using the methods described in Clark et al. (2005), except for metals which were analyzed, after nitric-acid digestion, by graphite furnace/atomic absorption spectrophotometry (GFAA) (Perkin-Elmer Zeeman 5100, Perkin-Elmer) in accordance with EPA Method 200.9.

#### **Results and Discussion**

## Laboratory "Leaching" and Simulated Runoff Tests

The results from the modified TCLP test were used to indicate if a pollutant "existed" in the material, and whether, over time, it might be released to the environment. The organic data indicated very little potential contributions of specific semivolatile organics (highest leachate concentration=315  $\mu g/L$  of bis(2-ethylhexyl) phthalate, a common plasticizer, in roofing felt). The lack of elevated bis(2-ethylhexyl) phthalate concentrations in other samples indicated that this result likely was not due to environmental contamination of the samples, but to dissolution of the felt paper in the leachant solution.

For the nutrients and metals, all samples were run in triplicate and the results averaged after background subtraction of the initial leachant solution concentration. These results are shown in Table 2. Even though each subsample was cut from the same intact panel of material, the heterogeneity of the materials themselves was reflected in the high variability seen in the data (in many cases, coefficients of variation were 2.0 or greater). Therefore, these comparisons were not made based on absolute values of the median concentration, but on general observations made from the data. The results from the nutrient testing showed release of nitrate and phosphate to the leachate, especially of phosphate from the galvanized metal. A review of hot-dip and cold galvanizing process information available online from several manufacturers indicated that phosphorus may be an ingredient in some binders and some wash solutions. The metals' results also showed that significant potential exists for metals to be leached from these materials as they degrade. This was expected for certain materials, such as the galvanized metal, the shingles, the treated wood, and several sealers that listed one or more metals as ingredients since certain metals were added as a protective coating or impregnated in the exposed surface of the material. Table 2 results highlight the reservoir of pollutants potentially available for release during storm events.

The leach testing indicated the "size" of the pollutant reservoir in new materials, but did not address the potential of aged roofing to release pollutants. Two aged (60+year old), painted metal roofing panels were evaluated using both leach testing and simulated rainfall. One panel was exposed to the atmosphere since installation and was rusted across approximately 75% of the surface area, while the other was an intact replacement panel. The panels were subjected to the following tests: (1) a dissolution test in which an approximate 100 g piece of the panel was submerged in concentrated nitric acid; (2) a leaching test (approximately 100 g) similar to the previously discussed laboratory work; and (3) a simulated rain exposure test. While these exact material formulations currently may not be available, these results were used to develop the field testing plan and to determine if an "end date" may exist in the pollutant release.

The lead results showed that releases from the aged panels were between 0.01 and 1 g/kg for the dissolution and leaching tests (not shown). Prior to testing, it was thought that lead would result mostly from what was likely lead paint. However, the testing on the bare metal (the nonrusted portion) showed lead concentrations equivalent to that of the painted metal, indicating two potential causes: (1) lead was a component of the metal roofing panel itself; or (2) lead was deposited on the bare metal surface and "contaminated" the bare roofing. Unlike copper and iron, lead also was released from the material during "rain."

The results for zinc are shown in Fig. 2 as a comparison between the results in the "leach" tests described above and simulated rain. The 2002 leach test results were designated as "pristine" panels since they were purchased less than 1 month before testing. The results indicated that substantial quantities were released from the material during both the dissolution and leaching tests. It also was apparent that "raining" on the material

Table 2. Laboratory Leaching of Building Materials<sup>a</sup>

Material	PO <sub>4</sub> (mg/kg)	NO <sub>3</sub> (mg/kg)	NH <sub>3</sub> -N (mg/kg)	COD (mg/kg)	CU (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Fe (mg/kg)
Asphalt/tar shingles	29.4 (0.5)	1.52 (0.4)	0.83 (0.8)	2,698 (0.4)	0.66 (1.1)	0.34 (0.5)	1.22 (0.3)	46.7 (0.2)
Roofing felt	44.6 (0.245)	4.2 (1.7)	108 (0.9)	26,367 (0.9)	0.026 (2.4)	0.11 (0.2)	0 (0.05)	1.87 (0.4)
Ondura red vinyl roofing	$0 (na)^b$	2.44 (2.4)	1.44 (0.4)	13,161 (0.6)	0 (na)b	0 (na) <sup>b</sup>	0 (na) <sup>b</sup>	$0 (na)^b$
Fiberglass roofing	0.86 (1.7)	$0 (na)^b$	$0 (na)^b$	0 (0.9)	0.017 (2.0)	0.005 (4.2)	0.53 (0.9)	$0 (na)^b$
White plastic roofing	$0 (na)^b$	0.99 (1.7)	$0 (na)^b$	6,842 (0.5)	0.076 (0.4)	0 (na) <sup>b</sup>	1.42 (0.1)	2 (0.7)
Cedar roofing shingles	1.23 (1.0)	$0 (na)^b$	0 (0.7)	18,852 (0.6)	0.033 (1.1)	0.11 (0.4)	0.64 (1.2)	1.64 (0.3)
Galvanized metal roofing	53.8 (1.2)	58.4 (0.3)	12.1 (0.2)	20,471 (0.1)	0.44 (0.5)	0.16 (1.2)	16,500 (0.03)	9,400 (0.4)
Galvanized metal roofing (replicate)	30.8 (1.5)	$na^b (na)^b$	1.14 (0.7)	0 (0.3)	0 (0.09)	1.61 (03)	11,900 (0.01)	3,300 (0.4)
Waterproofed wood	$0 (na)^b$	9.12 (0.2)	0 (na) <sup>b</sup>	0 (0.5)	161 (0.2)	0.29 (0.3)	3.72 (0.8)	3.22 (3.1)
Pressure treated wood	62.2 (0.06)	6.47 (0.2)	0.38 (0.8)	53,002 (0.2)	191 (0.05)	0 (na) <sup>b</sup>	1.35 (0.02)	2.69 (0.5)
Fake slate roofing shingle	0.07 (1.7)	2.71 (0.4)	$0 (na)^b$	0 (0.3)	0.2 (0.1)	0.42 (0.07)	1.81 (0.3)	20.1 (1.1)
Leak stopper rubberized roof patch	0.05 (1.7)	9.43 (0.5)	$0 (na)^b$	726 (15.4)	0.13 (0.5)	3.78 (0.8)	2.61 (0.9)	2.25 (1.0)
Kool seal acrylic patching cement	21.6 (1.7)	0 (na) <sup>b</sup>	$0 (na)^b$	2,297 (1.2)	0.15 (1.4)	0.65 (0.9)	2.94 (1.5)	229 (0.9)
Gardner Wet-R-Dri roofing patch	203 (0.6)	0 (na) <sup>b</sup>	0 (na) <sup>b</sup>	0 (2.7)	0 (11.1)	0.094 (1.3)	$0 (na)^b$	1.39 (5.1)
Silver dollar aluminum roof coating	0 (na) <sup>b</sup>	na <sup>b</sup> (na) <sup>b</sup>	na <sup>b</sup> (na) <sup>b</sup>	21,520 (1.1)	1.14 (1.0)	0.3 (6.1)	0 (na) <sup>b</sup>	151 (0.5)

<sup>&</sup>lt;sup>a</sup>Table value equals average concentration [coefficient of variation (std. dev./avg.) in parenthesis].

caused zinc to be released to the environment, although the magnitude of the release was >2 log less than the release from dissolution and leaching. While these results were not comparable directly since they were not from the same manufacturer and batch, they were indicative of the zinc reservoir that may be available for release into the environment under the right conditions in the order of several grams per kilogram of roofing panel. Comparatively, the lead, copper, and cadmium releases were 2-4 orders of magnitude less than zinc's releases.

#### Pilot-Scale Field Tests

The laboratory testing showed that these materials had a reservoir of pollutants that could be released if conditions were right. However, in order to perform these tests, the materials had to be cut to fit the test vessels. This cutting potentially exposed sublayers that would not be exposed during the material's normal life. The concern was that the cuts, in the aggressive environment of the testing, were the source of the pollutants and that the results would not be easily translatable to the field. Since both the PSH and UAB sites were in areas of the United States with acid rain, these sites were considered ideal for studying the long-term behavior of intact panels (installed according to manufacturer instructions). Because of the destruction of the UAB test site during a hurricane and its recent rebuilding, this paper focused on the PSH results.

Approximately 2 years of field monitoring occurred at PSH. The results are shown in Figs. 3-6 for four pollutants of interest: nitrate, reactive phosphorus, copper, and zinc, respectively. These results have been background corrected using the concentrations from the plexiglass control panel. Results were not included in this paper for pH, specific conductance, total nitrogen, total phosphorus, ammonia, and lead for every material. Since this testing occurred well after lead phaseout from gasoline, lead concentrations from the materials, after background correction, were approximately 0 mg/L. pH for all materials were below neutral, with runoff pHs measuring between 5 and 6.5 for all materials except the cedar shakes (consistently approximately 4.5-5).

For the nutrients and copper graphs, only the results from the treated woods and cedar shakes were incorporated. For zinc, only the galvanized metal and aluminum-zinc alloy coated steel were plotted. These materials were selected for each of these graphs because of the nature of the material—woods composed of nutrients in cells, and copper used as a preservative. Galvanized metal and the alloy coated steel both advertised zinc in the product. In addition, the daily rainfall, as reported by the National Weather Service for the Harrisburg International Airport, was included as a hyetograph on each figure. The airport monitoring location is across Pennsylvania State Route 230 from the test site (within 0.5 km of the test site).

To confirm that the site was subjected to acid rain, periodic monitoring of rainfall pH was conducted. The rainfall pH varied

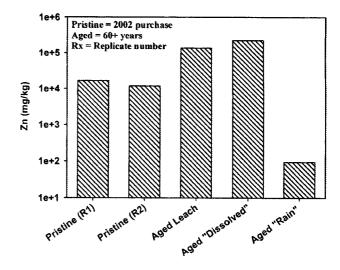


Fig. 2. Zinc in galvanized metals—comparison of new and aged materials

<sup>&</sup>lt;sup>b</sup>na=not available. Coefficient of variation cannot be calculated because none of the triplicate samples was indistinguishable from the background (material contribution was zero).

tration of the metal, rubber, and vinyl materials (data not shown),  $<\!70~\mu g/L$  at Day 50. The remaining materials from this group showed concentrations near background levels and less than  $20~\mu g/L$ . Runoff concentrations of copper for the two treated wood panels (Fig. 5) exceeded 5 mg/L for the first 9 months of exposure. Only after 270 days postinstallation did the copper concentrations from these woods approach the analytical range of the instrumentation. These results indicated that copper continued to be released from these wood products and at levels high enough to exceed the aquatic life criteria and that this release likely was not due to an excess surface coating that would wash off in the first few storms postinstallation.

The literature showed that zinc from traditional unpainted or uncoated hot-dip galvanized steel could be an environmental concern. Fig. 6 compares the zinc runoff concentrations from a traditional galvanized panel and from Galvalume, a prepainted aluminum-zinc alloy coating on steel. The results showed that the zinc runoff concentration was 5-30~mg/L throughout the first 2 years of monitoring for the traditional galvanized metal panel, while the prepainted aluminum-zinc alloy panel was less than  $250~\mu\text{g/L}$ , more than two orders of magnitude less. Whether the reduction in zinc runoff concentration was due to the painting/coating on the material or due to a different formulation/application method for the protective coating cannot be determined from these data.

The laboratory-scale research showed that there could be significant potential for pollutants (especially nutrients and metals) to be released from common roofing materials. However, the laboratory activities did not mimic the cyclic wet-dry weathering (including rainfall, ultraviolet radiation, temperature, etc.) to which these materials are exposed over the course of their 10-50 year life span. Therefore, to better predict the pollutant release over a material's installed lifetime, field testing was started in August 2005 and continues to date. The ongoing field tests confirmed several of the results seen in the laboratory. Metals, such as copper and zinc, still were being released from materials well after any short-term protective coatings should have washed off, indicating that measurable quantities of pollutants may continue to be released in an acid rain environment throughout the material's useful life. This contradicts prior assumptions that releases tended to stabilize to negligible levels over a product's lifespan. Given the large quantity of these materials installed in the environment, the overall contribution may be significant and deserves further investigation.

#### **Conclusions**

The laboratory leaching results showed that traditional galvanized metal roofing contributed the greatest concentrations of many of the pollutants of interest—specific conductance, cations, metals (particularly zinc), and nutrients. In addition, the metals' analyses showed that the pressure treated and waterproofed wood contributed substantial copper loads. The potential for nutrient release exists in many of these materials, such as from the galvanized metal (potentially as a result of phosphate washes and binders used in the material's preparation) and wood products due to natural degradation. Tests conducted in the laboratory on the aged roofing panels suggested that this pollutant release may occur for an extended period of time. The laboratory testing results were limited because they were single tests of a material (which had been precut, exposing edges and the underlying structure) and were performed under very aggressive conditions. Their results

were used to decide whether further investigation through a long-term field study was warranted. The 2 years of field testing that began in August 2005 documented low-level, long-term releases of many pollutants from these materials.

These results indicated that investigation of the potential environmental impact of roofing should be encouraged prior to the material entering the market. In addition, stormwater modeling and management should not ignore roofing when assessing sources of pollutants. Roofs do not simply collect atmospheric deposition and transport it to the drainage system. They also may, depending on the material's composition and ability to degrade and release pollutants, be a significant source of pollutants in urban runoff. These results, in combination with those generated from the UAB test site, will be used to develop models that account for the environmental and material characteristics that influence the degradation and release patterns seen in this study and others.

#### **Acknowledgments**

The writers would like to acknowledge the contributions of three undergraduate students at UAB—Blaine Collier, Amanda Lowry, and Bridget Shealy, and one graduate and two undergraduate students at PSH—Brad Mikula, Jim Elligson, and Christopher Roenning. In addition, the writers would like to express their appreciation to the following funding sources: Alabama Water Resources Research Institute and the Penn State Harrisburg Graduate Council Faculty Research Grants Committee.

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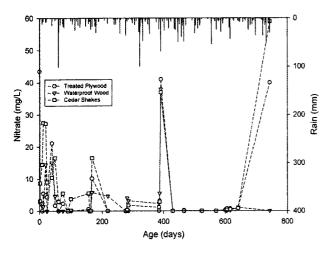


Fig. 3. Nitrate runoff concentrations for wood products

between 3.7 and 6.0, depending on the portion of the storm measured. In addition, the panels were inspected periodically for visible degradation.

The field results showed that nutrient concentrations were elevated early in the materials' lives (Fig. 3 for nitrate as nitrogen, and Fig. 4 for reactive phosphorus as phosphate). Figs. 3 and 4 focused on the wood-based materials only. The woods typically had higher concentrations than the metal-based or vinyl-type roofing for these pollutants. The metal, rubber, and vinyl concentrations (not shown) were closer to background levels with periodic spikes in the runoff (rubberized roofing reactive phosphorus spike of 32 mg/L at approximately Day 60; galvanized aluminum nitrate spike of 35 mg/L at Day 50). Similar trends were seen for ammonia, total nitrogen, and total phosphorus. In general, the highest concentrations of these nutrients were found in the runoff from the wood products, and in the case of the nitrate, the untreated wood. This was not surprising since the untreated wood was the first wood product to show visible degradation (a split in the wood), exposing the underlayers to the atmosphere. In addition, since these were wood products, the degradation of cells and the release of nutrients from the cell mass would be anticipated. Because these periodic spikes occurred throughout the 2-year observation period, including winter, and the control data were subtracted from the results before data

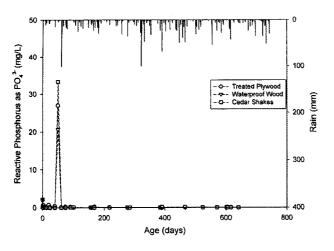


Fig. 4. Reactive phosphorus runoff concentrations for wood products

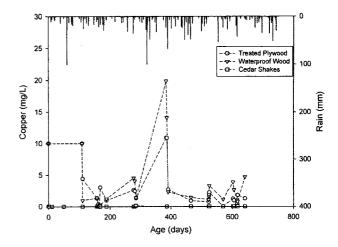


Fig. 5. Copper runoff concentrations for wood products (Note: all values above 5 mg/L are estimated concentrations because substantial dilution of the sample was needed to be within range of the analytical method)

analysis. These spikes were not believed to be due to wash-on/ blow-on of fertilizer or grass cuttings, but instead, resulted from the materials themselves. In addition, several of these spikes could be correlated to additional visible material degradation (i.e., splitting of the wood).

Good (1993) found that dissolved metals' concentrations and toxicity remained high in roof runoff samples, especially from rusty galvanized metal roofs during first flush and several hours after the rain started, indicating metal leaching continued throughout the events. Figs. 5 and 6 highlight the results for copper and zinc. As noted in the caption, many of the earlier samples from the treated woods had copper concentrations that were very high (upper analytical limit=5 mg/L; concentrations above 5 mg/L were measured using substantial dilution and are estimates only). Lead and arsenic concentrations were near background levels, indicating minimal concerns. This was contrary to the results seen by Khan et al. (2006), who noted elevated concentrations of arsenic from treated wood decks. For copper, preliminary results showed that releases were substantially higher than expected for many materials. Rubberized roofing had the highest Cu concen-

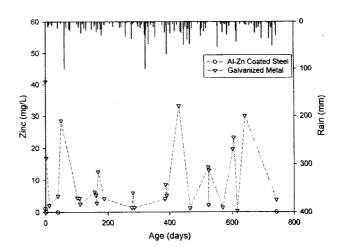


Fig. 6. Zinc runoff concentrations for galvanized metal and aluminum-zinc alloy coated steel

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Wetland Science
Wildlife Ecology
Landscape Architecture

#### **MEMORANDUM**

July 9, 2012

To:

Ms. Gretchen Brunner, EA/Blumen

From:

Rick Lundquist, Raedeke Associates, Inc.

RE:

Port Quendall — Addendum to Draft EIS:

Response to Public Comments and Analysis of Preferred Alternative

(R.A.I. No. 2010-014-004)

Per your request, the purpose of this memorandum is (1) to respond to public comments on the Draft EIS for the Port Quendall re-development project relating to wetlands and plants and animals, and (2) provide an analysis of a new Preferred Alternative, compared with project alternatives discussed in the Draft EIS. In particular, the response to public comments will address the comment from the Muckleshoot Indian Tribe Fisheries Division (dated January 25, 2011) and the City of Mercer Island (dated January 20, 2011) regarding lighting impacts from the proposed development on wetland and riparian habitat along Lake Washington, and recommended mitigation measures.

# RESPONSE TO COMMENTS ON LIGHTING IMPACTS

## **Impacts**

Potential human-disturbance related impacts to wildlife associated with wetland and riparian habitats on site include those related to increased artificial light associated with urban development. These include some artificial lighting during morning and late afternoon or evening hours, particularly during the winter. At full build-out, ambient light (from exterior lighting of buildings, walkways, roads, and traffic) is expected to increase over post-remediation conditions, as well as the existing condition of the abandoned site.

Although the topic has received increased research attention in recent years, understanding of the effects of artificial night lighting on behavioral community ecology of wildlife species and on ecological systems, such as wetlands and lakeshore habitats, is still limited. It is acknowledged that increases in ambient light can alter the behavioral ecology of a variety of organisms, including both invertebrates and vertebrates, from changes in orientation, as well as attraction or repulsion from the altered light environment. These in turn may affect foraging, reproduction, migration, and communication (Longcore and Rich 2004).

Ms. Gretchen Brunner July 9, 2012 Page 2

For example, many insects, such as moths, may be attracted to artificial lighting, and they may be subject to increased mortality. Some faster flying bat species may in turn congregate near lights to forage on the concentration of insects. Other, slower-flying bat species may avoid the lights, where increased food availability may be offset by increased risk of predation by owls. Similar relationships occur among other vertebrate groups, where some species may be adversely affected by artificial lighting and others may benefit. Artificial lighting may also alter the duration of light and dark, or photoperiod, experienced by plants. However, published information on the affects of artificial lighting on plants in natural settings is relatively limited. In aquatic systems, artificial lighting may affect foraging patterns of invertebrates and amphibians. Some fish species are attracted to artificial lighting, whereas others avoid foraging in lighted areas (Longcore and Rich 2001, 2004).

Impacts of artificial lighting from the proposed redevelopment should be considered in the context of the urbanized setting along this portion of Lake Washington, as well as the longer term land use history of the project site. Residential development stretches south from the project site, including the relatively recent development adjacent to the site, as well as more established residences along the shore farther south. The Seahawks headquarters and training facility lies to the north of the project, and additional residences line the shoreline farther north for a considerable distance. Thus, the impacts of artificial lighting represent an incremental addition to lighting along the shoreline in this area and are not considered significant.

Moreover, remediation work that would precede the proposed development involves removal of existing wetland and upland communities that are impaired by past contamination and capping the site. Following remediation, wetland and riparian communities along the shore on the project site would be newly established, prior to redevelopment. Impacts to the developing habitats can be minimized with appropriate mitigation. In addition, as the buffer areas develop, they would help screen the wetland and shoreline habitats from the development and associated lighting.

## Mitigation

The proposed development would include design elements to minimize the potential adverse affects of artificial lighting on wetland and riparian habitats. These include directing lights downward and away from these habitats or adjacent properties, and may include shielding of lights, use of low-pressure sodium lights, or minimizing the use of reflective glazing materials in building design, as feasible.

#### ANALYSIS OF PREFERRED ALTERNATIVE

The Preferred Alternative would entail a similar mixed-use development to that under Alternatives 1 and 2 (particularly Alternative 2) on the project site, but would maintain a Ms. Gretchen Brunner July 9, 2012 Page 3

larger setback from the on-site shoreline, consistent with the City's 2011 Shoreline Master Program. The shoreline habitat restoration area, encompassing the reestablished/expanded wetlands and their buffers along the lake shore, would encompass a larger area (approximately 128,900 square feet), as this alternative would maintain a 100-foot minimum shoreline setback from the delineated Ordinary High Water Mark (OHWM), as required by the City, compared with a 50-foot minimum setback for Alternatives 1 and 2. Thus, more native habitat would develop along the shoreline of Lake Washington following remediation.

As under Alternatives 1 and 2, no direct wetland impacts would occur under the Preferred Alternative. The wetlands along the lake would be reestablished and expanded in a similar fashion as the other development alternatives within a somewhat larger shoreline restoration area. No development would occur within the isolated eastern part of the site east of Lake Washington Blvd., thus no impacts would occur to Wetlands I and J, as under Alternatives 1 and 2.

The expanded riparian habitat restoration area along the shoreline would afford Wetlands A and D a minimum effective buffer that generally exceeds a minimum 50 feet. Buffer averaging would be proposed where necessary to compensate for buffer encroachments. This riparian area also includes an expanded trail that can also serve as an unpaved emergency fire lane. The ultimate plans for the shoreline restoration area under the Preferred Alternative will be developed in coordination with EPA.

The Preferred Alternative is assumed to include similar temporary and permanent storm drainage systems and erosion control features as Alternatives 1 and 2. Thus, similar to these alternatives we would not expect substantial indirect impacts to on-site wetlands and the lake under the Preferred Alternative from stormwater runoff during construction and operation of the project.

With a slightly smaller development footprint and similar site features such as the public trail, the redevelopment under The Preferred Alternative is expected to result in slightly less impacts to wetland and wildlife habitat as under Alternatives 1 and 2. As the restored habitat along the lakeshore develops over time, the added shoreline setback would provide slightly more potential screening of the wetland and lakeshore habitats from lighting impacts, compared with Alternatives 1 and 2. Given the urban context, however, impacts from disturbance and noise would not likely be significantly different from those under Alternatives 1 and 2.

Thank you for the opportunity to prepare this information. If you have any questions, comments, or need additional information, I am available at 206-525-8122 or via email at <a href="mailto:rwlundquist@raedeke.com">rwlundquist@raedeke.com</a>.

Ms. Gretchen Brunner July 9, 2012 Page 4

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# CITY OF RENTON COUNCIL AGENDA BILL

Subject/Title: Interlocal Agreement with Local Municipalities concerning NPDES II Permit	Meeting: Regular Council - 17 Sep 2012
Exhibits: Interlocal Agreement Talking Points Resolution	Submitting Data: Dept/Div/Board: City Attorney Staff Contact: Larry Warren, x6484
Recommended Action: Council Concur	

Fiscal Impact:			
Expenditure Required: \$	\$25,000	Transfer Amendment: \$	N/A
Amount Budgeted: \$	0	Revenue Generated: \$	0
Total Project Budget: \$	0	City Share Total Project: \$	\$25,000

#### **SUMMARY OF ACTION:**

DOE issued a new NPDES II permit applicable to the City. It is an unfunded mandate, highly complex, vague and, in some instances, very expensive to development. See the attached Talking Points for more detail.

There has been a consortium of 13 cities and one county formed, with more expected to join, to appeal the permit and to defend against likely appeals from the environmental community seeking to expand the permit. The Administration supports joining the consortium for many reasons including:

- 1. The permit is highly technical and the costs to the city to appeal the permit are probably less for the consortium than if the City appeals on its own and had to use staff time or outside experts.
- 2. The permit was issued with a 30-day appeal period, is multiple pages with two volumes of technical attachments. There isn't time for the City to be prepared to appeal the permit while outside counsel that participated in review of the draft are up to speed on the permit's contents.
  - 3. It helps if there is a show of force by local governments in the appeal.
  - 4. A joint appeal avoids conflicting positions between local governments.
- 5. A joint appeal accesses the many skills of the different government's attorneys, including the Renton City Attorney who is on the oversight committee.

The funding for this appeal will be added as part of the year end budget adjustment.

## **STAFF RECOMMENDATION:**

Approve an Interlocal Agreement with the Cities of of Auburn, Bainbridge Island, Bellevue, Burlington, Des Moines, Everett, Issaquah, Kent, Mount Vernon, Seatac, Snoqualmie and Sumner, and Cowlitz County regarding appealing the NPDES II permit and adopt the Resolution.

INTERLOCAL AGREEMENT BETWEEN THE CITIES OF AUBURN, BAINBRIDGE ISLAND, BELLEVUE, BURLINGTON, DES MOINES, EVERETT, ISSAQUAH, KENT, MOUNT VERNON, RENTON, SEATAC, SNOQUALMIE AND SUMNER AND COWLITZ COUNTY REGARDING LEGAL SERVICES

THIS INTERLOCAL AGREEMENT ("Agreement") is entered into between the Cities of Auburn, Bainbridge Island, Bellevue, Burlington, Des Moines, Everett, Issaquah, Kent, Mount Vernon, Renton, SeaTac, Snoqualmie, Sumner and Cowlitz County and any other Phase II Permittees that might join this Coalition of Governmental Entities (collectively, "Coalition").

## **RECITALS**

- 1. The members of the Coalition are public agencies as defined by Ch. 39.34 of the Revised Code of Washington, and may enter into interlocal agreements on the basis of mutual advantage to provide services and facilities in the manner and pursuant to forms of governmental organization that will accord best with geographic, economic, population, and other factors influencing the needs and development of local communities.
- 2. The Phase II National Pollutant Discharge Elimination System (NPDES) Permit is required under provisions of the Federal Clean Water Act and requires members of the Coalition in Washington to develop and maintain storm water programs. The Department of Ecology (DOE) has adopted standards (DOE Standards) purportedly under the NPDES Permit authority that may impose costly burdens on landowners, including members of the Coalition and may also cause costly legal challenges to members of the Coalition as a result of enforcing DOE Standards.
- 3. The potential impact of the DOE Standards on members of the Coalition and property owners is so significant and far-reaching, members of the Coalition are joining together to explore all legal and other avenues available to challenge the DOE Standards including but not limited to filing an appeal with the Pollution Control Hearings Board. The appeal deadline is August 31, 2012, the effective date of the DOE Standards. Members of the Coalition wish to retain outside counsel (Counsel) to represent the Coalition in said legal challenge(s) and wish to collectively pay Counsel as further set forth below.
- 4. NOW THEREFORE, in consideration of the terms and provisions contained herein, Coalition agrees as follows:

## **AGREEMENT**

1. <u>Purpose:</u> It is the purpose of this Agreement to have the Coalition collectively pay for the legal services of Foster Pepper PLLC, or other selected legal counsel(Legal Services) to represent the Coalition's interests in any legal challenges to the NPDES Phase

Il permits (Litigation).

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- 2. <u>Duration</u>: This Agreement shall be effective August 13, 2012, irrespective of the date members of the Coalition execute this Agreement. Unless terminated by any party in accordance with Paragraph 5, Termination, the Agreement shall remain in full force and effect through conclusion of the Legal Services either through settlement of the dispute with the State of Washington, Pollution Control Hearings Board order, court order or other court disposition by the highest court authorized to hear an appeal of this matter, and/or other mutual resolution of the legal challenge or Legal Services as agreed to among members of the Coalition as provided in Paragraph 5.2 of this Agreement.
- 3. Administration: Coalition shall enter into a Joint Prosecution Agreement for the administration of the Legal Services and Litigation. Said Joint Prosecution Agreement shall include, but need not be limited to, a confidentiality agreement, establishing a structure for the administration and oversight of the Legal Services and Litigation that is efficient and effective given the number of Coalition who are parties to this Agreement, including oversight of the legal costs incurred pursuant to this Agreement and any other subjects necessary or appropriate to the administration of the Legal Services and prosecution of the Litigation. If this Agreement is effective prior to finalizing the Joint Prosecution Agreement, Coalition authorize the City of Bellevue to be Lead Agency to do all things necessary and/or appropriate to pursue the Litigation on behalf of Coalition including but not limited entering into an agreement for Legal Services as contemplated herein.

# 4. Payment:

- 4.1 The Legal Services' fees and costs shall be shared by members of the Coalition based upon the cost-sharing formula set forth in Exhibit "A" attached hereto and incorporated by this reference. This obligation shall continue through conclusion of the Legal Services as provided in Paragraph 2 above, unless a member of the Coalition terminates its participation in this Agreement as provided in Paragraph 5. Members of the Coalition hereby authorize said fees and costs up to \$255,000. The amount of this authorization may be increased administratively with the addition of new Coalition members up to a total of \$500,000. Provided, however, any increase in the cost of legal services that would require additional payments from any Coalition members in excess of the obligations set forth in Exhibit "A" shall require amendment of this Agreement unless an individual Coalition member expressly volunteers to increase its share without the necessity of amendment of this Interlocal Agreement.
- 4.2 The provider of Legal Services shall provide a monthly bill of its fees and costs to Bellevue. Bellevue shall timely pay the bill on behalf of Coalition. Within 15 days of approval of this Agreement, each member of the Coalition shall remit its proportionate share of the fees and costs to the City of Bellevue. Bellevue shall place these funds into an interest-bearing account, with any interest derived from these funds to be applied to the costs of the provider of Legal Services. At the time of drafting of this Agreement 12 governmental entities have committed to joining this appeal, and based upon the cost—sharing formula set forth in Exhibit "A" hereto, each member of the Coalition is

obligated to make payment of its proportionate share to the City of Bellevue. In the event Bellevue must take legal action to collect any amount due from a member of the Coalition, Bellevue shall be entitled to recover all costs for said action including reasonable attorney's fees.

- 4.3 In the event additional governmental entities join this Agreement, each new member of the Coalition shall be obligated to payment to the City of Bellevue based upon the cost-sharing formula set forth in Exhibit "A".
- 4.4 While it is recognized that members of the Coalition may not be able to sign this Agreement before August 31, 2012 it is agreed that the members will benefit from the Legal Services provided herein. Therefore, it is presumed that a member of the Coalition which enters into and signs this Agreement agrees to pay for Legal Services performed from and after August 13, 2012, regardless of the date of signing. Adjustments to amounts previously billed and received by Bellevue due to later joining members of the Coalition will be reconciled on a semi annual basis.

# 5. Termination:

- 5.1 Termination by Notice: Any participating member of the Coalition may terminate its participation in this Agreement by providing at least sixty (60) days prior written notice to all other participating members. The terminating member must pay the full share of the Legal Services Fees and Costs due through the date of termination three months from the date of Notice. Should it become necessary to amend this Agreement to increase the authorized total amount of fees and costs set forth in Paragraph 4.1, or a member's proportionate share pursuant to Paragraph 4.3, any member may terminate its participation in this Agreement by providing written notice to all other participating members within 15 days of receiving written notice of the request to amend fees and costs. This termination shall not affect the obligation of the terminating member to pay its full share of the currently authorized Legal Services Fees and Costs, and shall not entitle the terminating member to any refund of monies already paid to the Coalition. Except as provided in Paragraph 5.2, the termination of a member's participation in this Agreement shall not result in the termination of this Agreement with respect to other members of the Coalition.
- 5.2 Termination by Mutual Written Agreement. This Agreement may be terminated at any time by mutual written agreement of a majority of the then participating members of the Coalition. Members shall be obligated to pay for Legal Services incurred to the date of Notice to the provider of Legal Services that its services are no longer needed and any reasonable additional fees and costs necessary to conclude its Legal Services.
- 5.3 Distribution of Assets upon Termination. It is not anticipated that any assets will be acquired as a result of participating in this Agreement. If, however, any assets are acquired with joint funds of the Members of the Coalition, those assets will be equally divided among the members at the asset's fair market value upon termination. The value of the assets shall be determined by using commonly accepted methods of valuation. Additionally, any funds remaining in the interest-bearing account following conclusion of all

Legal Services shall be divided among the members of the Coalition in amounts proportionate to the members' contributions to the Agreement based upon the cost-sharing formula contained in Exhibit "A and any other voluntary contributions made by that member.

## 6. Miscellaneous:

- 6.1 Amendments. Except as expressly provided herein, this Agreement may only be amended by mutual written agreement of the members of the Coalition.
- 6.2 Severability. If any section of this Agreement is adjudicated to be invalid, such action shall not affect the validity of any section not so adjudicated.
- 6.3 Interpretation. The legal presumption that an ambiguous term of this Agreement should be interpreted against the party who prepared the Agreement shall not apply.
- 6.4 Ownership of Property. Any property owned and used by Bellevue in connection with this Agreement shall remain the property of Bellevue and any property owned and used by any other participating member of the Coalition shall remain the property of that member, unless otherwise specifically provided in this Agreement or its amendment.
- 6.5 Notice. All communications regarding this Agreement will be sent to the parties at the addresses listed on the signature page of the Agreement, unless notified to the contrary. Any written notice shall become effective upon personal service or three (3) business days after the date of mailing by registered or certified mail, and will be deemed sufficiently given if sent to the addressee at the address stated in this Agreement or any other address if later specified in writing. Except for the requirement of Notice as provided in this Agreement, nothing herein shall be construed to prevent the members of the Coalition from communicating among themselves by email, fax or other electronic means. Any governmental agency not specifically named herein, that later joins in this Agreement, shall give to all members of the Coalition then participating under this Agreement written notice of the name and address of the person that can accept notices on behalf of such joining governmental agency.
- 6.6 Counterparts. This Agreement may be entered into with any number of counterparts which, taken collectively, will constitute one entire agreement.
  - 6.7 Ratification and Confirmation. All acts taken prior to the effective date of this Agreement that are consistent with the intent and purpose of the same are hereby ratified and confirmed retroactive to August 13, 2012.
- 6.8 Dispute Resolution. Should any dispute arise among members of the Coalition or between one or more members related to the interpretation, application or administration of this Agreement, the disputing parties shall participate in a good faith mediation effort to resolve their differences prior to bringing any legal action.

6.9 Compliance with RCW 39.34.040. Members of the Coalition entering into this Agreement shall be responsible for ensuring that it is filed in accordance with RCW 39.34.040.

IN WITNESS, the parties below execute this Agreement, which shall become effective August \_\_\_\_\_, 2012.

AUBURN:	BAINBRIDGE ISLAND:
CITY OF AUBURN	CITY OF BAINBRIDGE ISLAND
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BELLEVUE:	BURLINGTON:
CITY OF BELLEVUE	CITY OF BURLINGTON

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# NPDES PHASE II 2013-2018 PERMIT APPEAL FACT SHEET

This information is being provided to local governments that are governed by the recently re-issued National Pollutant Discharge Elimination System ("NPDES") Phase II Permit from the state Department of Ecology. It briefly describes some of the more significant permit conditions, the potential financial implications for permittees and development impacts for property owners. Finally, it offers reasons why it could be beneficial for Phase II jurisdictions to join forces again to form a coalition for purposes of fling an appeal of certain of the permit conditions with the Pollution Control Hearings Board ("PCHB"). The deadline for appealing the Permit is September 1, 2012, even though the Permit effective date is August 2013. Time is of the essence! WHAT ARE THE MOST SIGNIFICANT NEW PERMIT CONDITIONS?

# • Low impact Development

Low Impact Development ("LID") is now required at many sites to mimic hydrology of an old growth forest, including rain gardens for roof runoff and pervious pavement. Rules are highly complex, requiring detailed evaluation on a site-by-site basis, and long-term viability of LID has not been proven given high level of maintenance needed. (Note: Ecology added exceptions for poor soils, city arterial/collector roads, and others). Required by December 31, 2016.

# Feasibility versus Infeasibility

The original version of the Phase II Permit allowed for local governments to opt out of enforcing certain detention requirements where a property owner could demonstrate that it would not be feasible to comply with the requirements. The 2013-2018 Permit has reversed that standard and now requires that the local government demonstrate that it is infeasible for the applicant to comply. This may require costly and time-consuming expert studies to be conducted by the local government to meet this new standard.

# No Vesting

Vesting under City permits no longer extended to stormwater regulations. New Phase II Permit requirements apply to all applications submitted after December 31, 2016, and to any previously permitted project that hasn't started construction by January 1, 2022. This change will be most significant for projects that have development agreements or are otherwise phased. Depending upon timing of build-out, new, more extensive requirements will apply to projects that are approved between 2017 and 2022.

# Low Impact Development and Watershed Planning

Perform a comprehensive review of all codes to incorporate LID principles with the goal of making LID the preferred approach to site development, through minimization of impervious surfaces and native vegetation retention. Also, participate in watershed-scale planning studies with Phase I jurisdictions to evaluate possible additional changes in development codes, rules and standards that would benefit water quality. Required by December 31, 2016.

# Illicit discharge investigations

Field screening of 40% of storm system by 2017, and 12%/year thereafter.

# • One-Acre Threshold Removed

Under the first Phase II Permit, detention requirements only affected projects that disturbed greater than 1.0 acre. This threshold has now been removed, so detention requirements also include projects that are smaller than 1.0 acre. Redevelopment of small parcels is likely to become more expensive or even impractical with these new detention standards. Also, for sites involving greater than 1.0 acre, this now requires retrofit of stormwater detention to match the forested pre-developed condition, instead of just matching current conditions which in redevelopment scenarios doesn't require costly stormwater detention.

# Operations

Inspect all catch basins every two years (currently is every four years).

# WHAT ARE THE FISCAL IMPLICATIONS FOR PHASE II JURISDICTIONS?

These new requirements are likely to be very costly to implement. For example, the requirement that LID principles be integrated into all local codes regulating land use and development will require time-consuming review of codes and revisions to achieve this requirement. Significant staff resources may be expended on ensuring that all relevant codes are considered and updated. Additional training will be required to ensure that once changes are in place, project reviews are accomplished and development permits issued consistent with the new regulations.

Monitoring and other operational responsibilities are greatly increased, again requiring more staff time to achieve compliance. Phase II utilities expect that the costs of compliance with the terms of this permit will include hiring new permit review and operational staff. Increases in utility rates to cover these increased costs are estimated to be between 5% and 15%, as the new regulations go into effect over the next four years.

New, more onerous and far-reaching regulations will place Phase II jurisdictions in jeopardy of failing to comply with the Permit, which exposes those jurisdictions to costly and time-consuming citizen suits in addition to fines from Ecology and the U.S. Environmental Protection Aagency.

The implications of stifling re-development and new growth are important as local economies struggle for improvement. If the regulations make property development too costly for private investors, local economic development will stall out, impacting jobs and tax revenues for local government.

# WHY FORM A COALITION TO CHALLENGE PERMIT CONDITIONS?

Forming a coalition of Phase II jurisdictions to challenge some of the permit conditions has many benefits:

- A united group of permit holders challenging the new regulations sends an important
  message to the PCHB, our communities and our state legislators. If a large number of
  jurisdictions participate in the appeal, the very real logistical and fiscal problems
  associated with the new regulations will be presented to the Board.
- Appealing the permit assures that local jurisdictions will be able to defend against challenges brought by groups seeking to make the permit conditions even more onerous and costly. The Phase II Coalition that challenged the original permit successfully

negotiated a "safe harbor" for self-reporting water quality violations to Ecology to protect against citizen suits. It is possible that this safe harbor could be challenged before the PCHB in this appeal, without a local government presence to defend it.

- Individual jurisdictions will have a seat at the table—whether it be in challenging permit
  conditions, defending permit conditions, or seeking negotiated changes to the permit, to
  ensure that local concerns are addressed.
- Litigation is costly. The more Phase II permit holders we have join this coalition, the lower individual costs will be for all members.
- A substantially-sized coalition may be more successful in seeking legislative relief if negotiations and/or litigation are not successful.

Because the appeal deadline is looming, it is important that interested Phase II Permittees decide quickly whether to participate in the Coalition. Because many local legislative bodies will not be meeting again until after the Labor Day holiday, formal approval of an Interlocal agreement forming the Coalition by all participants will not be possible. If your jurisdiction is interested in participating, however, please contact Bellevue City Attorney Lori Riordan at (425)452-7220 to discuss your level of interest and what financial contributions will be sought from participants to fund the appeal. We would like to hear from you no later than August 29, 2012.

# CITY OF RENTON, WASHINGTON

R	ESO	LU	TION	NO.	

A RESOLUTION OF THE CITY OF RENTON, WASHINGTON, AUTHORIZING THE MAYOR AND CITY CLERK TO ENTER INTO AN INTERLOCAL AGREEMENT WITH THE CITIES OF AUBURN, BAINBRIDGE ISLAND, BELLEVUE, BURLINGTON, DES MOINES, EVERETT, ISSAQUAH, KENT, MOUNT VERNON, SEATAC, SNOQUALMIE AND SUMNER, AND COWLITZ COUNTY REGARDING LEGAL SERVICES.

WHEREAS, the City of Renton and the Cities of Auburn, Bainbridge Island, Bellevue, Burlington, Des Moines, Everett, Issaquah, Kent, Mount Vernon, Seatac, Snoqualmie and Sumner and Cowlitz County (collectively, the "Parties") are authorized, pursuant to RCW Chapter 39.34, to enter into an interlocal government cooperative agreement; and

WHEREAS, the Phase II National Pollutant Discharge Elimination System (NPDES)

Permit is required under provisions of the Federal Clean Water Act and requires the Parties to develop and maintain storm water programs; and

WHEREAS, the Department of Ecology ("DOE") has adopted standards purportedly under the NPDES Permit authority that may impose costly burdens on property owners, including the Parties and may also cause costly legal challenges to the Parties as a result of enforcing DOE Standards; and

WHEREAS, the potential impact of the DOE Standards on the Parties and property owners is so significant and far-reaching, the Parties are joining together to explore all legal and other avenues available to challenge the DOE Standards including but not limited to filing an appeal with the Pollution Control Hearings Board; and

WHEREAS, August 31, 2012 was the appeal deadline is and the effective date of the DOE Standards. Members of the Coalition wish to retain outside counsel to represent the Coalition in the legal challenge(s) and wish to collectively pay counsel as further set forth in the

<b>RESOL</b>
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interlocal agreement;

**NOW, THEREFORE,** THE CITY COUNCIL OF THE CITY OF RENTON, WASHINGTON, DOES RESOLVE AS FOLLOWS:

**SECTION I.** The above recitals are found to be true and correct in all respects.

Bonnie I	. Walton, C	ity Clerk	

APPROVED BY THE MAYOR this \_\_\_\_\_ day of \_\_\_\_\_\_, 2012.

Denis	Law,	Mayor		

Approved as to form:

Lawrence J. Warren, City Attorney

RES.1573:9/6/12:scr

October 18, 2012



Department of Community and Economic Development C.E. "Chip" Vincent, Administrator

Campbell Mathewson Century Pacific, L.P. 1201 Third Avenue #1680 Seattle, WA 98101

Subject:

NOTICE OF ISSUANCE AND AVAILABILITY - EIS ADDENDUM

Quendall Terminals/LUA09-151, EIS, ECF, BSP, SA-M, SM

Dear Mr. Mathewson:

This letter is written on behalf of the Environmental Review Committee (ERC) to advise you that they have completed their review of the subject project, and notice is hereby given under WAC 197-11-510 and RMC 4-9-070 that the Environmental Impact Statement Addendum (EIS Addendum) was issued on Monday, October 15, 2012, and is available for public review and comment.

Copies are available for review at the Renton Main Library, located at 100 Mill Avenue South, and the Renton Highlands Branch Library, located at 2902 NE 12<sup>th</sup> Street, and at Renton City Hall, Customer Service Counter, 6th floor, 1055 South Grady Way, Renton WA 98057, and on the City of Renton web site: <a href="https://www.rentonwa.gov">www.rentonwa.gov</a>.

Written comments on the EIS Addendum will be accepted for a 30-day comment period, ending **November 19, 2012** and should be addressed to: Vanessa Dolbee, Senior Planner; City of Renton, CED-Planning Division, 1055 South Grady Way, Renton, WA 98057

Please refer to the enclosed Notice of Issuance and Availability for complete details. If you have questions, please call me at (425) 430-7314.

For the Environmental Review Committee,

Vanessa Dolbee Senior Planner

Enclosure

cc: Altino Properties, Inc. and JH Baxter & Co. / Owners Parties of Record

# **Summary of the WRIA 8 Conservation Strategy**

The Puget Sound Technical Review Team (PSTRT, 2001) has identified two independent populations of Chinook in WRIA 8: the Cedar River and Sammamish River Chinook. The Sammamish River population includes North Lake Washington and Issaquah sub-populations. In their determination of population structure, the PSTRT notes that it is unclear whether the tributaries draining into the north end of Lake Washington historically supported an independent Chinook population. However, the PSTRT has also identified two factors indicating that this area has the potential to support independent Chinook populations. First, the PSTRT states that the Sammamish River drainage (including Issaquah Creek and the North Lake Washington Tributaries) is larger than the smallest watershed containing an independent population in their analysis of Puget Sound Chinook populations. Second, a recent analysis of spawner capacity developed for the PSTRT by NOAA Fisheries (NOAA Fisheries 2003) indicates that the Bear/Cottage system, the lower portion of North Creek, and Issaquah Creek have a high probability of supporting Chinook spawning, while Swamp Creek, Little Bear Creek, Carey and Holder Creeks, and the upper portion of North Creek have a moderate probability of supporting Chinook spawning.

While two populations are identified in WRIA 8 by the PSTRT, recent genetic information available at the time the Conservation Strategy was developed indicated that there may be enough difference between the North Lake Washington Chinook and fish returning to the Issaquah Creek Hatchery to consider them separate from one another (Marshall 2000). In addition there are other differences such as run timing (e.g., the North Lake Washington Chinook run starts earlier than Issaquah Hatchery returns, peaks at approximately the same time, and tails off over a longer period) that may reflect genetic differences between North Lake Washington and Issaquah Chinook that should be maintained.

After much discussion, the WRIA 8 Technical Committee decided to take a precautionary approach and plan for three populations: the Cedar River population, the North Lake Washington population, and the Issaquah population. The Technical Committee recognizes that the Issaquah and North Lake Washington populations are closely linked, with the Issaquah Hatchery population influencing the North Lake Washington population. The W8TC based their decision to plan for three populations on the desire to adopt a conservative approach to WRIA 8 Chinook populations in light of uncertainties about population structure, and the potential that unique genetic characteristics necessary for the long-term viability of the Issaquah and North Lake Washington populations, if lost, may not be recovered. By identifying three populations, the WRIA placed priority on protecting all Chinook within the watershed, as well as any local adaptations that these fish possess. This approach supports the continued survival of offspring of naturally spawning Issaquah Hatchery Chinook strays which would be protected under the Endangered Species Act. In addition, the three population approach errs on the side of caution to maintain future opportunities for conservation in the Issaquah sub-area. Finally, this approach confers ancillary benefits on other species such as coho, and supports the widest level of stakeholder participation, all of which are consistent with the Steering Committee's stated goals and objectives. Throughout this document, three populations will be discussed, consistent with the direction that WRIA 8 chose to take with Chinook recovery. The reader should note that the use of the term 'population' as it relates to Chinook throughout this document reflects the WRIA 8 Technical Committee's precautionary approach, and that the term is therefore NOT synonymous with the PSTRT's use of the term.

The discussions surrounding WRIA 8 population structure are continuing as new information materializes. In 2003, returning adult hatchery Chinook were adipose-clipped for the first time. Stray rates in that year indicated that there were more hatchery-origin fish on the spawning grounds than expected (22% of spawners in the Cedar River mainstem, 54% of spawners in Bear/Cottage Creeks, and 48% of all spawners in the WRIA). While straying is a natural phenomenon, the large releases of hatchery fish (e.g. 2 million Chinook fry are released annually from the Issaquah hatchery) combined with small populations of naturally-spawning Chinook in WRIA 8 (average adult returns to the Cedar River, for example, was only 325 fish between 1998 and 2002) mean that the relatively high contribution rates of hatchery-origin fish could pose a risk to the genetic diversity of the Cedar and North Lake Washington populations.

The WRIA 8 Technical Committee has initiated a genetic study with Washington Department of Fish and Wildlife (WDFW) to analyze juvenile samples taken from the three assumed populations in WRIA 8, samples from hatcheries known to contribute to adult returns (e.g., University of Washington, Issaquah, Grover's Creek), as well as archived scale and tissue samples from adult spawners. It is expected that this study will help address a number of uncertainties surrounding current genetic differences that exist among wild and hatchery Chinook stocks in WRIA 8. However, it is likely that there will be continued questions regarding the interactions of hatchery and wild Chinook. The WRIA 8 Technical Committee and participating scientists will review the genetic study and share the information to the PSTRT for consideration in identifying independent populations within WRIA 8. If necessary, the Technical Committee will then adapt the Conservation Strategy in light of this new information.

The current risk of extinction posed to the WRIA 8 Chinook populations is extreme and must be reduced through actions that create habitat conditions that support viability of each population. There is some uncertainty that the NLW and Issaquah populations are independent of one another. Based on this uncertainty and the declining productivity trend of the Cedar population, the Technical Committee hypothesizes that a relatively higher priority should be placed on risk reduction for the Cedar River Chinook population.

# Cedar River Chinook

The greatest source of risk comes from reduction in habitat productivity and the potential loss of the instream juvenile rearing life history strategy. In addition, hatchery influences pose a significant risk to the genetic diversity of the population. Rehabilitation of the Cedar River Chinook population requires conservation actions to protect and restore habitat in the Tier 1, Tier 2, and migratory subareas. The main source of productivity for this population is in the Tier 1 subareas along the mainstem of the Cedar River. Restoration of these subareas is important to increase productivity and create habitat conditions that support the instream juvenile rearing life history strategy. Hypotheses about conservation actions are focused on the protection of water quality and highquality instream habitats used for spawning and juvenile rearing, such as intact pool habitats, riparian buffers, and LWD. Restoration hypotheses are focused on increasing the availability of pool habitats and off-channel areas for juvenile Chinook by reconnecting floodplain areas, adding LWD, and re-planting riparian vegetation. In addition to restoration actions in the mainstem Cedar, juvenile Chinook would benefit from shoreline restoration actions designed to improve rearing and refuge habitat and reduce predator efficiency in the south end of Lake Washington and in the Ship Canal.

Shoreline restoration activities should focus on removal of bulkheads and rip-rap to create sandy, shallow habitat areas. These restoration actions should be focused on areas adjacent to the mouth of the Cedar River and in nearby areas of southern Lake Washington, along the south end of Mercer Island, at the mouths of small creeks, and in Union Bay.

# North Lake Washington Chinook

The low abundance of the NLW Chinook population results from reduced habitat productivity and severe reduction in the spatial distribution of the population from several streams systems with approximately equal contribution to the population (Bear, Little Bear, North, and Kelsey Creeks) to one stream system (Bear Creek) that is the core of the population. In addition, hatchery influences pose a significant risk to the genetic diversity of the population. In order to rehabilitate this population and reduce the risks of extinction, conservation actions should be targeted at protecting the existing source of productivity in the Bear Creek system, restoring the habitat capacity of the Tier 2 NLW tributary systems, and restoring the channel meanders and pool habitats that support juvenile rearing and adult migration in the Sammamish River corridor.

# **Issaquah Creek Chinook**

The Technical Committee is concerned about the risk to independent Chinook populations posed by straying of hatchery and naturally-produced hatchery-origin Chinook. In 2003, approximately 50% of spawners in WRIA 8 were hatchery-origin fish, with percentages as high as 75% in some stream systems. Based on this data and past genetic analyses of NLW and Issaquah Chinook, the Technical Committee calls on NOAA fisheries and the co-managers to implement the recommendations of the Hatchery Science Review Group (HSRG, 2004) and make any other appropriate management changes at the Issaquah and other Puget Sound hatcheries that are necessary to reduce risk to the Chinook populations in WRIA 8. Within the Issaquah system, conservation actions for the Issaquah Chinook population should focus on protection of existing high-quality habitat in the Issaquah system.

Although restoration hypotheses have been identified by the Technical Committee, restoration actions for Chinook should not proceed until NOAA Fisheries has concluded the status of the WRIA 8 populations. Based on current information about the genetics and stray rates of Issaquah-origin Chinook, the Technical Committee hypothesizes that restoration of habitat in the Issaquah system and Lake Sammamish could increase the already high spawning contributions from hatchery strays in the WRIA and thereby increase the risk to genetic diversity of the Cedar and NLW independent Chinook populations.

# Migratory and Rearing Areas

In order to create and maintain habitat conditions that support viable populations of Chinook, conservation actions should address habitats used at different stages of the Chinook life cycle. Restoration and enhancement of the migratory and rearing areas (including the nearshore, estuary, Lake Washington, the Ship Canal and Locks, the Sammamish River, and Lake Sammamish) have a high potential to benefit Chinook productivity and abundance, and in many cases could benefit multiple populations. In the lakes, actions should focus on creating habitat conditions that improve rearing and refuge opportunities, such as the restoration of sandy shallow water areas and restoration of stream deltas. In the Sammamish River, re-meandering of the river will

restore connections with cool groundwater while increasing habitat diversity, benefiting juvenile out-migrants as well as returning adults. High temperatures in the Ship Canal during the juvenile out-migration can become extremely stressful (>19 C) and affect the behavior and success of smolts in reaching Puget Sound. High temperatures may also affect predation rates in the Ship Canal, especially those of bass. Conservation actions should focus on providing habitat refuge for Chinook and reducing high temperatures that drive predation. Finally, the nearshore and estuary subareas are critical for migration and rearing of Chinook populations (as well as other species) from multiple WRIAs. While there are relatively greater uncertainties about nearshore habitat and Chinook use of that habitat, experimental approaches to the protection of functioning habitat and the restoration of ecosystem processes (particularly sediment supply) and habitats (particularly eelgrass beds and 'pocket' estuaries) should be implemented.

# Uncertainties Regarding Hatchery Contribution to Natural Spawning of Chinook

In 2003, returning adult hatchery Chinook were adipose-clipped for the first time. Stray rates in that year indicated that there were more hatchery-origin fish on the spawning grounds than expected (48% on average in WRIA 8, 22% in the Cedar River, 54% in Bear Creek). While this represents only one year of data and the genetic impacts of this level of straying and spawning contribution from decades of hatchery operations are not known, the Technical Committee has taken a precautionary approach and identified hatchery straying and the potential contribution to natural spawning as a significant risk to the genetic diversity of WRIA 8 Chinook. The Technical Committee, in cooperation with WDFW, has initiated an analysis to evaluate the genetic differences between WRIA 8 populations and nearby hatchery stocks, and a report is expected in February 2005. Additional studies will be needed to evaluate the following questions:

- How much of a contribution do hatchery strays make to the genetic pool in the Cedar and NLW tributaries?
- How does straying affect the local adaptation of the Cedar and NLW groups (e.g., what is the reproductive success of hatchery strays)?
- How does hatchery straying affect population dynamics/persistence given low returns?

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# OF ENVIRONMENTAL DETERMINATION ISSUANCE OF A DETERMINATION OF SIGNIFICANCE (DS)

POSTED TO NOTIFY INTERESTED PERSONS OF AN ENVIRONMENTAL ACTION

PROJECT NAME:

PROJECT NUMBER:

LOCATION:

**Quendall Terminals** 

LUA09-151, EIS, ECF, BSP, SM, SA-M

4350 Lake Washington Blvd N

**DESCRIPTION:** 

The applicant is requesting Master Plan Review, Binding Site Plan, Shoreline Substantial Development Permit and Environmental (SEPA) Review for a mixed-use development. The site is 21.46 acres and is zoned Commercial/Office/Residential (COR) and located within the Urban Shoreline designation. The 21.46-acre site would be divided into 7 lots of which 4 would contain six - 7 story mixed-use buildings. Overall, the development would consist of 800 residential units (resulting in a net residential density of 46.4 units/acre), 245,000 square feet of office, 21,600 square feet of retail and 9,000 square feet of restaurant. The applicant has proposed to dedicate 3.65 acres for public right-of-way, which would provide access to the 7 proposed lots. Surface and structured parking would be provided for 2,171 vehicles. The site contains approximately 0.81 acres of wetlands and 1,583 linear feet of shoreline along Lake Washington. The subject site has received a Superfund designation from the U.S. Environmental Protection Agency (EPA) and the property owners are currently working on a remediation plan with EPA. Proposed improvements include remediation of existing contamination, stormwater and sewer improvements.

THE CITY OF RENTON ENVIRONMENTAL REVIEW COMMITTEE (ERC) HAS DETERMINED THAT THE PROPOSED ACTION MAY HAVE A SIGNIFICANT ADVERSE IMPACT ON THE ENVIRONMENT.

The lead agency has determined this proposal is likely to have a significant impact on the environment. An Environmental Impact Statement (EIS) is required under RCS 43.21C.030(2)(c) and will be prepared. An environmental checklist, or other materials indicating likely environmental impacts, are available for viewing in the lead agency's office.

LEAD AGENCY:

City of Renton

**Environmental Review Committee** 

THE LEAD AGENCY HAS INITIALLY IDENTIFIED THE FOLLOWING AREAS FOR DISCUSSION IN THE EIS:

Earth, Aesthetics/Views, Critical Areas, Land and Shoreline Use, Recreation/Public Shoreline Access, Public Services Utilities, Vegetation, and Transportation/Traffic.

ALTERNATIVES: This is a proposal for a private project. The applicant may study reasonable alternatives that could feasibly attain or approximate the proposal's objectives, but at a lower environmental cost or decreased level of environmental degradation. In this case, the alternatives will include the no-action alternative. A lower density alternative, with fewer residential units and less commercial development, may also be included.

SCOPING: Agencies, affected tribes, and members of the public are invited to comment on the scope of the EIS. You may comment on alternatives, mitigation measures, probable significant adverse impacts, and licenses or other approvals that may be required. Your comments must be submitted in writing and received before 5:00 p.m. on March 12, 2010. All written EIS scoping comments must be sent to Vanessa Dolbee, Senior Planner at the address noted below.

PUBLIC MEETING/OPEN HOUSE: A public EIS scoping meeting/open house will be held to provide an opportunity for the public to learn more about the proposed actions and to provide input into the environmental review process. An EIS public scoping meeting will be held at Renton City Hall at a date and time to be determined, additional notice will be provided of the meeting date and time.

PROJECT PROPONENT:

Campbell Mathewson, Century Pacific, L.P.

**RESPONSIBLE OFFICIAL:** 

**City of Renton** 

**Environmental Review Committee** 

**Department of Community & Economic Development** 

Planning Division 1055 S Grady Way Renton, WA 98057

**SEND COMMENTS TO:** 

Vanessa Dolbee, Senior Planner

Department of Community & Economic Development

Planning Division 1055 S Grady Way Renton, WA 98057 Phone: (425) 430-7314

To appeal this Determination, you must file your appeal document with the Hearing Examiner within fourteen (14) days of the date the Determination of Significance (DS) has been published in the official city newspaper. See City Code Section 4-8-110.E, RCW 43.21C.075 and WAC 197-11-680 for further details. There shall be only one appeal of the Determination of Significance and if an appeal has already been filed, your appeal may be joined with the prior appeal for hearing or may be dismissed if the other appeal has already been heard. You should be prepared to make specific factual objections. Contact the above office to read or ask about the procedures for SEPA appeals.

Appeals of the environmental determination must be filed in writing on or before 5:00 p.m. on March 5, 2010. Appeals must be filed in writing together with the required fee with: Hearing Examiner, City of Renton, 1055 South Grady Way, Renton, WA 98057. Appeals to the Examiner are governed by City of Renton Municipal Code Section 4-8-110.B. Additional information regarding the appeal process may be obtained from the Renton City Clerk's Office, (425) 430-6510.



# **⇔EPA** Issue Paper 5

# Summary of Technical Literature Examining the Physiological Effects of Temperature on Salmonids

Prepared as Part of EPA Region 10 Temperature Water Quality Criteria Guidance Development Project

Dale McCullough, Columbia River Intertribal Fish Commission

Shelley Spalding, U.S. Fish and Wildlife Service

Debra Sturdevant, Oregon Department of Environmental Quality

Mark Hicks, Washington Department of Ecology

# **Issue Paper 5**

# Summary of Technical Literature Examining the Physiological Effects of Temperature

# Region 10 Temperature Water Quality Criteria Guidance Development Project

Dale McCullough, Shelley Spalding, Debra Sturdevant, and Mark Hicks

# **Abstract**

The chief objective of this paper is to provide a literature review of the role temperature exerts on the physiology of various salmonids. The fish are affected as species and within the stages of their life history. The thermal environment, perhaps more than any other aquatic habitat feature, influences the distribution, health and survival of our native salmonids. Temperature tolerances for salmonid species typically refer to effects of temperature on an individual. Because we are interested in sustainable populations of salmonids, this paper also reviews information on the optimal or preferred ranges of temperatures that will be needed to promote long-term survival, growth, and reproductive success.

Thermal stress occurs when a temperature or a change in temperature produces a significant change to biological functions leading to decreased likelihood of survival. Thermal stress can lead to lethal effects either immediately, in a period of days, or even weeks or months from the onset of the elevated temperature. Thermal stress can also result in "sublethal" or indirect effects resulting in death or reduced fitness that impairs processes such as growth, spawning, smoltification, or swimming speed. Metabolic processes are directly related to temperature, and the metabolic rate increases as a function of temperature. Fish are metabolically efficient and most likely to thrive within the preferred range of temperatures.

Different species of salmonids have evolved to utilize different thermal regimes, although there is much overlap in their utilization of these regimes. Anadromous salmonids and coastal cutthroat and rainbow trout tend to have similar temperature requirements; however, where multiple species and life stages are present, temperature criteria need to protect the most sensitive species and life history stage. For this guild, maximum growth and swimming speed occur at 55.4-68°F (13-20°C) under satiation feeding; reduced ATPase levels are experienced at temperatures as low as 51.8-55.4°F (11-13°C), potentially resulting in delayed or ineffective smoltification; adult migration may be blocked at 69.8-73.4°F (21-23°C); and temperatures of 42.8-50°F (6-10°C) or lower during incubation result in maximum survival and size at emergence. Bull trout have lower temperature requirements than other salmonids with optimal incubation occurring at 35.6-42.8°F (2-6°C), spawning being initiated as temperatures drop below 48.2°F (9°C), and the maximum growth rate at satiation feeding occurring at 60.8°F (16°C). For other salmonids such as redband trout, westslope cutthroat trout, and mountain whitefish, little information is available on the effects of temperature on their physiology.

# Introduction

The distribution, health, and survival of our native fish species are inextricably linked to the thermal environment. Temperature, perhaps more than any other environmental parameter. greatly affects the status of fish and other aquatic life. With respect to thermal effects, lethal temperatures do occur in the field and can be locally problematic in defining usable and unusable habitat. Sublethal effects of temperature determine the overall well-being and patterns of abundance of our native fish populations. Temperature exerts its control through its effect on the physiology of the individual species and their life stages. In addition, individuals within a species population vary in their responses (e.g., lethal, growth) to temperature, generally according to a bell-shaped distribution. As species individually or relative to one another experience temperatures outside their physiological optimum range, the mix of species present in any given waterbody may drastically change. Aside from direct mortality caused by very high temperatures, temperature influences the abundance and well-being of organisms by controlling their metabolic processes. Every species, including disease organisms, has optimal metabolic ranges. Community composition is shaped by the level of numerous components of the habitat system, including temperature, food, water, light, substrate, and so on, each of which can provide optimal or suboptimal conditions. Temperature is one of the single most influential determinants of habitat quality and can also act synergistically with other habitat elements.

Temperature through its effect on physiology influences the ability of fish to grow, reproduce, compete for habitat, and escape predators. This issue paper examines the role of temperature in the physiology of the salmonids native to the Pacific Northwest, and the importance of lethal temperature effects compared with various types of sublethal effects in controlling the survival and health of native fishes.

For further information on the effects of temperature on salmonids, we suggest you refer to both the Behavior and Temperature Interaction issue papers in this series. This issue paper is drawn heavily from existing extensive reviews of thermal effect literature (Berman 1998, EPA and NMFS 1971, Hicks 1999, 2000, McCullough 1999, ODEQ 1994) and is intended to extract from this large body of literature the key documents illustrating various concepts and effects. For additional guidance to the literature on thermal effects, we recommend starting from these references.

The intention of this paper is to review physiological effects of temperature regimes for all salmonids. However, the authors acknowledge the scarcity of relevant bull trout information and have avoided including observations or case studies that are difficult to extrapolate, as is the case with much of the bull trout temperature literature. In cases where there is information available on a closely related charr species, that information may be included.

In the following questions and answers, we first summarize thermal requirements for salmonid incubation and early fry development, growth, smoltification, swimming speed, migration to spawning, and adult holding and spawning, and discuss lethal effects. Then we present detailed documentation and references.

### Low Impact Development Feasibility Matrix

This matix evaluates feasibility of individual Low Impact Development techniques with specific site conditions and considerations. The methodology breaks a complex question of feasibility into manageable individual evaluations and then let's us take an overall look at the trends.

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Benefits →								<u> </u>			BENEFIT FOR BE	duction de la lac	Lawrence Co.	
		Porou	s Pavement/ Co	ncrete			Diamagad					Native		
Note: The scenarios I've listed below are difficult scenarios for LID rather than all scenarios.	Traditional Retention Pond *	Fully Porous Driving Surface	Impervious Travel Lane with Porous Shoulder	Sidewalks/ Trails	Bioretention	Compost Shoulder Treatment	Dispersed BMP's throughout Site	Dispersion	Minimal Excavation	Soil Amendments	Green Roofs	Vegetation/ soils Preservation	Stormwater reuse	Ecology Embankme
Site Conditions														
Inderlying Soils (not topsoil)														
Soils - poorly draining		2,50	2.38	2.25	2.38									
Soils - moderate to well draining														
Slopes														
Steep Slopes > 15%			Kert Die Zand			2.50	2.50		2.25					
Moderate Slopes > 6% <15%	3.00	3.00	2.88	2.25	2,38	2,25								
Gentle Slopes < 6%														
Seasonal High Groundwater		1												
At the surface"						3.38	2.75	2.88	2.50					2.33
Within 1-foot of surface				2.88		2.38								
Contaminated Soils			tic com the control to the automorphism to the in-											
		T												
Land Use								Ļ						
		ļ			<del></del>	<del></del>			ļ		<del> </del>			
Roads and Driving Surfaces						10/4			N/A	N/A	N/A	N/A	N/A	
nternal Subdivision Roads						N/A				N/A	N/A	N/A	N/A	
Collector Roads									N/A			N/A	N/A	
Arterial Roads		2.63							N/A	N/A	N/A			
Parking lots									N/A	N/A	N/A	N/A	N/A	
Driveways									N/A	N/A	N/A	N/A	N/A	
Residential & Commercial														
Highly Urban Landuse densities						2.13		2.13		2.13				
Commercial / Retail Development														
Suburban zoning														
Rural Zoning														
ndustrial Zones		2.50		_						2.13				
O&M Feasibility														
łeliability														
Certainty on Maintenance Technique		2.17	2.17											
Acceptance of technique by owners		2.83	2.83	2.25	2.17					2.25	2.17	2.38	2.50	2.33
		<del> </del>	ļ										<b> </b>	
Economic Feasibility														
n comparison to most recent higher														
egulatory standards		3.00	3.00		3.00	3.00		3.00		3.00	2.50	3.00	3.00	
Construction Costs		2.78	2.33							2.25	2.56		3.00	
Maintenance Costs		2.56	2.33							2.25	2.33		3.00	2.33

\*Traditional Retention Ponds that provide WQ treatment prior to full infiltration are not typically considered to be Low Impact Development but are thought to fully meet the NPDES Permit requirements.

YELLOW

Average from each community. Snohomish and Pierce Counties had multiple scoring sheets so an intermediate average was done for each and then averaged with King and Tacoma. Port of Seattle is not include at this time due to submitting a pdf rather than the spreadsheet.

=< 2.5 =< 3 =< 9.5

# RCW 90.48.520 states:

90.48.520. Review of operations before issuance or renewal of wastewater discharge permits—Incorporation of permit conditions

\*14 In order to improve water quality by controlling toxicants in wastewater, the department of ecology shall in issuing and renewing state and federal wastewater discharge permits review the applicant's operations and incorporate permit conditions which require all known, available, and reasonable methods to control toxicants in the applicant's wastewater .... Such conditions shall be required regardless of the quality of receiving water and regardless of the minimum water quality standards. In no event shall the discharge of toxicants be allowed that would violate any water quality standard, including toxicant standards, sediment criteria, and dilution zone criteria.

The permittees make much of the fact that the Legislature used the word "wastewater," and they argue that based on a dictionary definition of the term, wastewater is different than stormwater. Ecology responds by focusing on the last sentence of this provision, which refers to all discharges without limitation by the word wastewater; by arguing that wastewater includes stormwater; and by pointing out that the Legislature must have been using the term wastewater broadly, since as a technical matter there are no state or federal "wastewater" discharge permits. [FN5]

The parties then turn to a review of the Legislative history of the bill, which they provide for the Board if the Board concludes RCW 90.48.520 is ambiguous. There is an extensive amount of legislative history pertaining to RCW 90.48.520. See Potter Decl. Exs. 1-7. This history reveals that RCW 90.48.520 arose out of an effort by the Legislature to address standards for industrial wastewater that is discharged into sewage treatment plants and to address the separation of sewage and stormwater transport systems. Washington Laws, 1985, Ch. 249, Sections 1 and 2. During this same time period (1985 through 1987), the Puget Sound Water Quality Authority [FN6] published their 1987 Puget Sound Water Quality Management Plan (Plan), which focused on the need to effectively control contaminants from multiple pollutant sources in order to protect Puget Sound. This Plan is referenced in the Senate Bill Report for ESHB 499, the Bill that

eventually became <u>RCW 90.48.520</u>. See Potter Decl., Ex. 4. The Plan addresses urban stormwater runoff in several places. A key reference from the Water Quality Plan, cited by Ecology in its brief, states:

Although urban runoff has traditionally been considered a nonpoint source, as a result of a lawsuit brought by the National Resources Defense Council against EPA in 1976, urban runoff is now coming to be considered a pointsource. Pursuant to the results of the lawsuit, revised EPA regulations require dischargers of urban runoff to apply for an NPDES permit by December 31, 1987.

Potter Decl., Ex. 5A, at 4-11.

This reference reflects that <u>RCW 90.48.520</u> was debated and adopted at a time when the status of discharges from MS4s under federal law had recently been clarified as point source discharges subject to NPDES permitting.

\*15 From all of the material presented to the Board regarding the scope of the WPCA, the Board finds most persuasive that the WPCA, unlike the FCWA, makes no distinction between municipal stormwater, other types of stormwater, and other types of polluted discharges. To reach the conclusion advocated for by the municipalities, that MS4 discharges are not covered under the WPCA, the Board must conclude that none of the general WPCA statutes apply to any stormwater discharges-industrial, construction, or municipal. [FN7] This interpretation is not consistent with the Board's past precedent, nor with the regulatory efforts of Ecology to place increasingly more stringent requirements on stormwater management in each of these sectors through general permits, many of which have been reviewed by this Board. See, for example, Puget Soundkeeper Alliance and Northwest Marine Trade Association v. Ecology, PCHB Nos. 05-150, 05-151, 06-034, & 06-040 (2007) (Findings of Fact, Conclusions of Law, and Order) (discussing the regulatory history of boatyards.)

Ecology's longstanding interpretation, expressed through its water quality regulations, its past permitting decisions, and the position it has taken in the current permits is that <u>all</u> waste discharge permits, federal or otherwise, must be conditioned so the discharges authorized will meet water quality standards. <u>WAC 173-201A-510(1)</u>; <u>Port of Seattle v. Pollution Control Hearings Board</u>, 151 Wn.2d 568, 603, 90 P.3d 659 (2004). The first MS4 permits issued by

Ecology in 1995 acknowledge the application of the state water quality standards to the permit, and the use of the compliance schedule exception to address the anticipated violations of those standards by MS4 discharges under the permit. See Terry Decl., Ex. E. (see generally, the Compliance with Standards Section of the submitted permits.). The current permits, Special Conditions S.4. A and B, state that discharges of toxicants to waters which would violate water quality standards are prohibited, and that the permit does not authorize violation of Washington State surface water quality standards. All of these actions reflect Ecology's interpretation that MS4 discharges are subject to the same requirements as any other stormwater discharge. This interpretation, coming from the agency charged with administering the WPCA and the state water quality standards, is entitled to great weight. Port of Seattle, at 593-594.

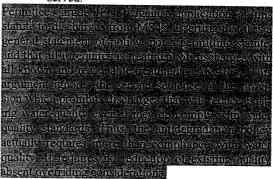
Ecology's actions are significant in two ways: First, stated above, they indicate Ecology's interpretation, which is entitled to weight. Second, in the face of these actions by Ecology to include discharges from MS4s under the WPCA, the Legislature appears to have acquiesced in Ecology's interpretation of RCW 90.48.520, which is that this statute did not need to be amended to establish separate rules for discharges from MS4s. Although it is a rule of statutory construction that absent evidence of the Legislature's knowledge of an administrative interpretation, legislative inaction does not indicate acquiescence in the interpretation, Department of Labor and Industries v. Landon, 117 Wn.2d 122, 127, 814 P.2d 626 (1991), the Legislature's knowledge of Ecology's interpretation of this statute can be reasonably inferred. The Legislature adopted RCW 90.48.555 and other sections pertaining to stormwater discharges during the 2004 legislative session. The Legislature's adoption of this legislation in 2004 would necessarily make it aware of Ecology's general approach in regulating stormwater discharges. As stated earlier, to conclude that MS4 discharges are not covered under the WPCA, it is necessary to conclude that none of the general WPCA statutes apply to any stormwater discharges. The Legislature did not deem it necessary to amend RCW 90.48.520 or otherwise enact explicit statutory authority for Ecology to regulate stormwater discharges during the 2004 session. The Legislature's lack of action during that time, or since, can reasonably be construed as acquiescence in Ecology's interpretation. Therefore, the Board concludes that the WPCA does apply to discharges from MS4s, and

prohibits discharges that violate water quality. <u>RCW 90.48.160</u>, .162, .180 and .520.

# 3. RCW 94.54.020(3)(b)

\*16 A final piece of the state statutory scheme cited by the parties is RCW 90.54.020(3)(b), the state's anti degradation policy. Port of Seattle, at 590. This statutory provision, which was adopted as part of the state Water Resources Act of 1971, identifies water quality as a fundamental goal in utilizing and managing the state's waters. RCW 90.54.020(3)(b). It states:

Waters of the state shall be of high quality. Regardless of the quality of the waters of the state, all wastes and other materials and substances proposed for entry into said waters shall be provided with all known, available, and reasonable methods of treatment prior to entry. Notwithstanding that standards of quality established for the waters of the state would not be violated, wastes and other materials and substances shall not be allowed to enter such waters which will reduce the existing quality thereof, except in those situations where it is clear that overriding considerations of the public interest will be served.



Permittees' second argument is that even if a discharge from an MS4 impairs water quality, it does not violate the statute because MS4 permits meet the public interest exception allowed by RCW 90.54.020(3)(b). Ecology responds, stating that WAC 173-201 A-320(4) sets out the actual process for meeting the "overriding public interest" exception, and that process has not been followed here. Ecology contends that this provision calls for the applicant to make a request for a determination of public interest and submit information to Ecology as required by the rule, and then Ecology will make a determination. Ecology states that there has never been a request

from the permittees to start this process. The Board agrees with Ecology that, absent an initial determination by Ecology, this argument is not ripe for review.

A comprehensive reading of WCPA, along with the state's antidegradation statute, and a review of Ecology's rulemaking in response to this legislative direction, leads the Board to the conclusion that state law does not treat municipal stormwater any differently than any other storm water discharges to state waters. Other permitted discharges must comply with state water quality standards, and so must permitted discharges from MS4s.

Even if we were to read state law in a more limited fashion, we would still conclude, alternatively, that Ecology has more than ample discretion to require compliance with water quality standards. As the concurrence so well states, this discretion is well-based in the provisions of the FCWA that allow states to enforce more stringent standards for the discharge of pollutants, as well as those specific provisions of state law that provide Ecology broad authority to administer the permit program intended to eliminate pollution from state waters. 33 U.S.C. § 1370; RCW 90.48.260. Ecology has imposed such standards through both the regulations cited above, and the terms of this general permit.

\*17 That the Board reads these provisions of state law to require municipalities to comply with water quality standards, does not mean that Ecology lacks discretion to define the manner, method and timing for requiring compliance with these standards. To the contrary, Ecology has considerable leeway in defining permit terms that will effect compliance over the short and long-term, discretion to fashion enforcement methods, ability to define the manner in which compliance schedules should be utilized, and powers to define, through permit terms, the ongoing iterative process necessary to achieve ultimate compliance with water quality standards. In Waste Action Project v. Ecology, PCHB No. 97-69 (1997) (Order Granting Summary Judgment), the Board upheld Ecology's issuance of a new NPDES permit to Foss Maritime Company for its stormwater discharges. Ecology determined that previous effluent standards were unattainable with the requisite BMPs, so it suspended the effluent limits for certain metals and allowed a compliance schedule to determine and implement AKART. The Board found that this did not violate the anti-backsliding provisions governing NPDES

permits or the state's antidegradation policy. In a challenge to the NPDES permit issued to the Port of Seattle for stormwater discharges associated with SeaTac Airport, the Board upheld the permit over the allegation that the permit impermissibly failed to require more stringent limitations necessary to assure stormwater discharges met water quality standards. Port of Seattle v. Ecology, PCHB Nos. 03-140, 03-141, 03-142 (2004) (Findings of Fact, Conclusions of Law, and Order). The Board noted the meaningful efforts underway to obtain information regarding the sources of copper and zinc runoff, Ecology's requirement in the permit for a receiving water study, and the permit's requirement for the Port to use enhanced BMPs as needed once the necessary information became available. Division I of the Court of Appeals recognized the discretion of Ecology to administer the NPDES discharge permit program, and stated that "the statutory scheme envisions that effluent limitations will decrease as technology advances." Puget Soundkeeper Alliance v. State, 102 Wn. App. 783, 790-791, 9 P.3d 892 (2000). While Ecology must not allow an impermissible selfregulatory system, Environmental Defense Center v. United States Environmental Protection Agency, 344 F. 3d 832, 854 - 856 (9th Cir. 2003), it can use the general permit regulatory process to define what will be considered adequate permit compliance, and what is adequate progress toward compliance with water quality standards. Whether the terms of this permit, and particularly Special Condition S4.F are an adequate or legally correct exercise of Ecology's discretion, is discussed below.

In light of this analysis, the Board concludes that both Condition S4.A and B are appropriate statements of state law, and therefore, appropriate permit standards and conditions. The second sentence of both of these provisions is the "link" to Condition S.4.F., the permit condition that sets out the required response to violations of the statements of state law set forth in S.4. A and B. All parties take issue with the operation of S.4.F, and to the manner in which it works in relation to expected violations. We next address this issue.

# D. S.4.F

\*18 S.4.F sets out a notification and response process for what the permit labels "violations of water quality standards pursuant to S.4.A and/or S.4.B" Ecology refers to this notification and response process as "the compliance pathway." The parties raise two chal-

lenges to this process. The first challenge involves the proper characterization of an S.4.A or S.4.B event that triggers the S.4.F notification and response process. Are these events properly characterized as permit violations, or does a permit violation occur only if the permittee fails to follow the process outlined in S.4.F? Stated another way, is every discharge that is prohibited by S.4.A or not authorized by S.4.B a violation of the permit, even if the permittee responds as required by those provisions and fully complies with the S.4.F "compliance pathway?"

Concern about this question appears to be the driver behind much of this case. Municipalities are fearful that, under one reading of the permit language, they will be subject to citizen lawsuits for FCWA violations whenever a discharge that causes or contributes to a violation of water quality standards is reported. PSA and the utilities, on the other hand, are concerned that under a different reading of the same permit language, municipalities will be allowed to continually and indefinitely violate state water quality standards—but still be in compliance with their permits—so long as they notify Ecology and follow the "compliance pathway."

The permit on its face presents somewhat contradictory language on this point. See S.4.A and B ("The required response to such violations is defined in section S.4.F. below." Emphasis added); S.4.F.2.e. ("Provided the Permittee is implementing the approved BMPs, pursuant to the approved schedule, the Permittee is not required to further modify the BMPs or implementation schedule unless directed to do so by Ecology.")

The second challenge raised by the parties involves both procedural and substantive requirements of S.4.F. Disputes exist regarding the reasonableness of the timeframes, the sufficiency of the standards to ensure ultimate compliance with water quality standards, and the legal implications for permittees that fully comply with the S.4.F process but continue to have discharges that cause or contribute to violations of state water quality standards. See S.4.F.2.e.

The Board declines to address the issues surrounding the validity of Special Condition S.4.F on summary judgment. While in the end some of these issues may be questions of law, the Board hesitates to address them without a more complete understanding of the intended meaning and operation of S.4.F. Answering the many questions involving interpretation of S.4.F clearly requires factual testimony.

# E. S.4 Issue 6

S.4 Issue 6 questions whether the prohibition on violations of water quality standards contained in Special Condition S.4 unlawfully or unreasonably conflict with the other provisions of the permit. This issue is based on a misstatement of the relationship between S.4 and the other conditions of the permits.

\*19 Condition S.4 establishes the legal standards that permittees must meet and establishes a process for permittees to use to come into compliance with those standards. The purpose of the Board's review of S.4.A and B is to first determine whether the legal standards they express are correct (we conclude that they are), and whether S.4.F establishes an appropriate compliance mechanism (the Board has deferred this issue to factual hearing). If other provisions of the permit conflict with the legal standards established in Condition S.4 (and affirmed by the Board), it is these provisions that must be modified, not Condition S.4. Thus Issue 6 is really a challenge to other unnamed provisions of the Phase I permit, and not to Condition S.4. For that reason, Issue 6 is more appropriately left to the Phase I and Phase II hearings.

The issues statements for both the Phase I and Phase II permit appeals already contain issues that capture PSA's contention that the permit provisions will not achieve compliance with water quality standards. See Phase I Third Pre-hearing Order, issue F.4 and Phase II Third Pre-hearing Order, issue 16a. Therefore, the Board defers consideration of S.4 Issue 6 until we consider Phase I, Issue F.4 and Phase II, Issue 16a.

Based on the foregoing analysis, the Board enters the following:

# ORDER

Summary Judgment on S.4 Issue 1 is granted in favor of Ecology to the extent we conclude Ecology has the legal authority to include requirements beyond MEP in Special Condition S.4 of the Permit.

The Board does not grant summary judgment to any party on S.4 Issues 2 through 5, and 7, and instead directs that these issues proceed to hearing. The Board requests factual testimony on the process and

# Artificial Selection and Environmental Change: Countervailing Factors Affecting the Timing of Spawning by Coho and Chinook Salmon

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Abstract.—Spawning date is a crucial life history trait in fishes, linking parents to their offspring, and it is highly heritable in salmonid fishes. We examined the spawning dates of coho salmon Oncorhynchus kisutch and chinook salmon O. tshawytscha at the University of Washington (UW) Hatchery for trends over time. We then compared the spawning date patterns with the changing thermal regime of the Lake Washington basin and the spawning patterns of conspecifics at two nearby hatcheries. The mean spawning dates of both species have become earlier over the period of record at the UW Hatchery (since the 1950s for chinook salmon and the 1960s for coho salmon), apparently because of selection in the hatchery. Countering hatchery selection for earlier spawning are the increasingly warmer temperatures experienced by salmon migrating in freshwater to, and holding at, the hatchery. Spawning takes place even earlier at the Soos Creek Hatchery, the primary ancestral source of the UW populations, and at the Issaquah Creek Hatchery. Both species of salmon have experienced marked shifts towards earlier spawning at Soos Creek and Issaquah Creek hatcheries despite the expectation that warmer water would lead to later spawning. Thus, inadvertent selection at all three hatcheries appears to have resulted in progressively earlier spawning, overcoming selection from countervailing temperature trends.

Compared with most other fishes, salmonids produce large eggs with a protracted incubation period. Spawning date is the primary factor controlling the date when offspring emerge from the gravel in the spring, and it is an adaptation to the prevailing ecological conditions during incubation and emergence, influencing juvenile survival and growth (Brannon 1987; Brännäs 1995; Webb and McLay 1996; Einum and Fleming 2000; Quinn et al. 2000). The timing of adult migration and reproduction differs greatly among salmonid populations, but within populations, timing varies only slightly among years (Ricker 1972; Brannon 1987; Groot and Margolis 1991). Timing of migration and reproduction is largely under genetic control in a variety of salmonid species (Siitonen and Gall 1989; Hansen and Jonsson 1991; Su et al. 1997; Smoker et al. 1998; Quinn et al. 2000). Dates of

migration and spawning seem to reflect selection for adult passage (Quinn and Adams 1996) and incubation of embryos (Brannon 1987), and timing diverges in populations transplanted outside their range (Quinn et al. 2000).

The high heritability of spawning date means that it can be affected rapidly by artificial selection in hatcheries as well as by natural selection. Practices in hatcheries can directly select for the timing of maturation if early-maturing fish are spawned and late-maturing fish are discarded. Indirect selection for early maturation may also occur if the progeny of late-maturing fish are (1) culled as too small, (2) cannot compete in the hatchery with the larger progeny of early spawners, (3) fail during the smolt transformation process, or (4) have lower survival rates at sea. Deliberate selection for spawning date in steelhead Oncorhynchus mykiss in Washington resulted in markedly earlier spawning, allowing hatchery staff to grow the fish to smolt size in 1 year rather than 2 years (Ayerst 1977; Crawford 1979). Progressively earlier spawning has also been documented in lower Columbia River coho salmon O. kisutch populations (Flagg et al. 1995).

The timing of salmon migration and reproduction is thus affected by environmental conditions and artificial selection, but how might the fish re-

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spond to a combination of these pressures? To investigate this question, we examined detailed data, collected since the 1950s, on coho salmon and chinook salmon O. tshawytscha spawning at the University of Washington (UW) Hatchery. Our goals were to (1) test the hypothesis that the timing of spawning by coho and chinook salmon has become earlier since the 1950s, (2) determine whether timing patterns are consistent with salmon avoidance of warm temperatures during spawning, and (3) compare the spawning timing of chinook and coho salmon populations at the UW Hatchery with that at the Issaquah Creek Hatchery in the same basin and that at the Soos Creek Hatchery, the primary ancestral source of the UW populations.

### Methods

History of the UW Hatchery.—In the early 1930s, Dr. Lauren Donaldson conducted preliminary experiments on the growth and culture of salmon and trout at the UW campus (Hines 1976). After World War II, Dr. Donaldson designed and constructed a salmon and trout hatchery on the UW campus to facilitate his research on radiation ecology. The first chinook salmon were released in 1949, and the UW Hatchery ponds and fishway became operational in 1950 (Allen 1959). The salmon migrate about 8 km to the hatchery from Puget Sound (Figure 1) via the Lake Washington Ship Canal, opened in 1917 to link Lake Washington and Lake Union to Puget Sound by way of the Hiram Chittenden Locks. The hatchery was modified in 1960, when a bulkhead was built, turning a cove in Portage Bay into a holding pond for returning adult salmon. The facility has otherwise been structurally similar since its construction.

The chinook and coho salmon populations were primarily derived from the Green River system (Soos Creek Hatchery; Figure 1), though exchanges with other populations took place over the years. The Soos Creek Hatchery itself has had exchanges with many other populations, chiefly, but not exclusively, within Puget Sound. The UW Hatchery successfully produced chinook salmon since the 1950s. The population is ocean-type (i.e., migrate to sea in their first year of life; Healey 1991), characteristic of most lowland Puget Sound hatchery and wild populations (Myers et al. 1998). Coho salmon were also introduced in the 1950s (Donaldson and Allen 1958) from Soos Creek Hatchery. However, the UW Hatchery's main water source is the Lake Washington Ship Canal, which drains the epilimnion of Lake Washington, and the water

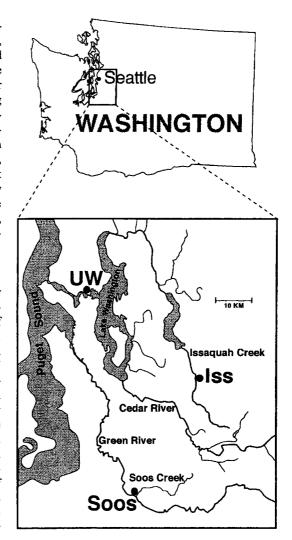


FIGURE 1.—Map of central Puget Sound, showing the locations of the University of Washington (UW), Issaquah Creek (Iss), and Soos Creek (Soos) hatcheries.

temperatures in the summer often prove stressful or lethal for juvenile coho salmon. In the 1950s and early 1960s, the numbers of returning coho salmon were low and variable. In 1967, additional smolts were brought from Soos Creek Hatchery and released, and their returns in 1969 represent the present lineage of this species at the UW Hatchery. To avoid problems associated with the UW Hatchery's warm summer temperatures, coho salmon are reared on an elevated temperature regime during incubation and are fed heavily so they can reach a suitable size for smolt transformation in their first spring (Feldmann 1974; Donaldson and Brannon 1976; Brannon et al. 1982), unlike

the region's typical wild and hatchery populations, which rear in freshwater for a full year before migrating to sea (Sandercock 1991; Weitkamp et al. 1995).

Dr. Donaldson practiced selective breeding of rainbow trout and chinook salmon, especially in the early years (1953-1972) of the UW Hatchery. The objectives of the breeding program were to select chinook salmon for early maturation age, rapid growth, high fecundity, and high survival rate of eggs, fry, and fingerlings (Donaldson and Menasveta 1961; Donaldson 1970; Hines 1976). There may have been some selection against latematuring salmon by culling their progeny (E. L. Brannon, personal recollection), but there are no specific records to demonstrate this. No control lines were kept, and the strength of the selection and its effects on any of the traits are unclear. Since Dr. Donaldson's retirement in 1972, there has been no directed selection on spawning date and only episodic selection experiments with other traits. such as age at maturity. The Soos Creek and Issaquah Creek hatcheries have been operated by the Washington Department of Fisheries (now Department of Fish and Wildlife) since 1901 and 1936, respectively.

Data collection and analysis.—Since the late 1950s, all salmon returning to the UW Hatchery were checked for ripeness and, when ripe, were killed, identified, measured for fork length, and weighed; the date was also recorded, along with any marks or other pertinent data. The spawning operation was typically conducted on Monday, Wednesday, and Friday of each week, when every fish was identified to species and sex, and checked for ripeness to spawn. Ripe fish were sacrificed and later spawned by extracting the eggs from females and fertilizing them with milt from males. The date of spawning closely represents the date females were fully mature, but males remain ripe over a longer period of time, and surplus males were sometimes killed to thin out the number of salmon being held. Because the date when males were killed is not a reliable indicator of maturation date, we only analyzed data for females. Females not fully mature when killed for spawning were excluded from the analyses, as were females that died in the pond prior to being spawned. Females that spawned all or some of their eggs in the gravel-lined hatchery pond before being killed were used for analysis because their spawning date would have been no more than a day or two from the date recorded.

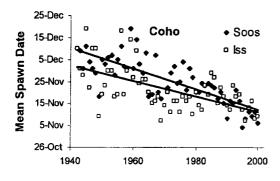
The data were examined for trends over the years in spawning date of the UW Hatchery coho

and chinook salmon, and spawning timing patterns of UW Hatchery populations were compared with those of conspecifics from the Issaguah Creek and Soos Creek hatcheries. For the latter analysis, we obtained data from 1960 to 2000 for chinook salmon and from 1942 to 2000 for coho salmon (data from earlier years were not available). Spawning typically took place once or twice weekly at these hatcheries. At Soos Creek and Issaquah Creek hatcheries (unlike the UW Hatchery), not all salmon are spawned and recorded. Salmon in excess of the hatchery's capacity may be killed, and some salmon spawn in the nearby creeks. Thus, the records from those hatcheries reveal trends in timing but are less representative than those at the UW Hatchery, where no natural spawning occurs and where records of all salmon are kept. We calculated the median spawning dates (i.e., date when 50% of the annual total had been spawned) and the mean dates for each year and species to assess possible changes over time. The distributions did not differ from normality. Means and medians showed identical patterns and explained similar amounts of variation, so we conducted all analyses on mean dates.

To compare the spawning date trends with local thermal regimes, we obtained data collected from a limnology station at the surface of Lake Washington since 1972 (T. Edmondson and D. Schindler, University of Washington, Department of Zoology, unpublished data). Both the UW and Issaquah Creek hatchery populations swim through the ship canal, and the Issaquah Creek fish also swim through the lake, so surface temperatures generally represent the thermal regime experienced by these populations. We also obtained data on the temperature regimes of Soos and Issaquah creeks, collected at the hatcheries with minimum-maximum thermometers since 1972. Temperatures recorded daily from 1984 to 2000 were used to characterize the present thermal regimes of these sites. Prior to 1984, only weekly data were available, so we calculated monthly mean temperatures from 1972 to 2000 to assess trends in temperature.

# Results

Coho salmon at the UW Hatchery have been spawning progressively earlier, from late November in 1969 to the middle of November at present (Figure 2), with a significant fit to a linear relationship (P < 0.001, slope = -0.31,  $r^2 = 0.22$ ). The coho salmon spawning dates have not only become earlier but also less variable, as indicated by a linear decrease in the standard deviation of



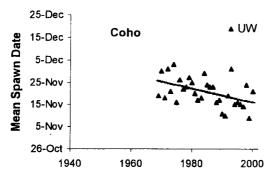


FIGURE 2.—Mean spawning dates of female coho salmon at the Issaquah Creek (Iss) and Soos Creek (Soos) hatcheries (top panel) and at the University of Washington (UW) Hatchery (bottom panel).

the mean spawning date from about 20 d in 1969 to about 12 d in 2000 (P = 0.013,  $r^2 = 0.19$ ). Chinook salmon at the UW Hatchery spawn earlier in the year than coho salmon, and their mean date has also become earlier from 1954 to 2000 (P <0.001, slope=-0.19,  $r^2 = 0.33$ ), but the change has been smaller than that seen in the coho salmon (Figure 3). In the first 24 years of data, the peak of the chinook salmon spawning season ranged from late October to mid-November, and in the past 23 years, the spawning season has consistently peaked within the last week of October. The variability in spawning date, as indicated by the standard deviation, has shown no trend over the period of record ( $r^2 = 0.037$ ). However, this trend is influenced by the first four years of records, when very few (8-34) salmon returned and their spawning dates varied greatly. Since 1958, the variability in spawning date has increased slightly (from about 7.5 to 9 d; P < 0.01,  $r^2 = 0.15$ ).

Trends towards earlier spawning were detected for both coho and chinook salmon at Issaquah Creek and Soos Creek hatcheries (coho salmon: Issaquah Creek  $r^2 = 0.36$ , Soos Creek  $r^2 = 0.62$ ; Figure 2) (chinook salmon: Issaquah Creek  $r^2 = 0.62$ ;

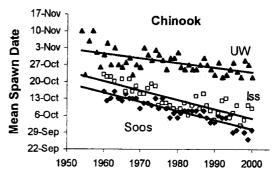
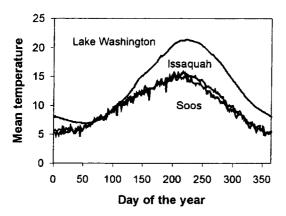


FIGURE 3.—Mean spawning dates of female chinook salmon at the Issaquah Creek (Iss), Soos Creek (Soos), and University of Washington (UW) hatcheries.

0.68, Soos Creek  $r^2 = 0.84$ ; Figure 3). The modern UW Hatchery coho salmon population was derived from the Soos Creek population, and the first generation returned in 1969. At that time, the spawning dates of the populations were nearly the same (regressions of spawning date over time for the populations intersect in 1973). However, in the most recent period (1995-2000), the UW coho salmon mean spawning date (18 November) was later than the Soos Creek (8 November) and Issaquah Creek (11 November) mean spawning dates. In contrast, the UW and Soos Creek chinook salmon populations differed in spawning date over the entire period of record (Figure 3), and are several weeks apart at present (mean dates from 1995 to 2000: 30 September at Soos Creek, 8 October at Issaquah Creek, and 26 October at UW). Analysis of the data since 1995 revealed significant (P < 0.001) variation among sites and years, but most of the variation was among sites (analysis of variance [ANOVA] F-values for site comparisons were 2,096.9 for coho salmon and 14,250.8 for chinook salmon, compared with 481.5 for coho salmon and 48.2 for chinook salmon among years). For both species, fish spawned earliest at Soos Creek Hatchery, followed by Issaquah Creek Hatchery and then UW Hatchery.

The Lake Washington surface temperatures peaked in mid-August and commonly exceeded 19°C in summer (21.3°C was the peak average daily temperature; Figure 4, top panel). Linear regression indicated significant increases in the average temperatures for August (P < 0.05), September (P < 0.001), October (P < 0.001), and November (P < 0.05). The mean daily temperature pattern for September is particularly important because it represents the best water temperatures experienced by UW and Issaquah Creek salmon in



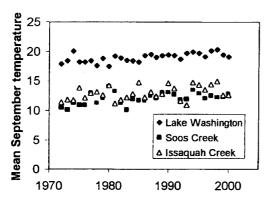


FIGURE 4.—Average surface temperatures (°C) in Lake Washington, Soos Creek Hatchery, and Issaquah Creek Hatchery from 1984 to 2000 (top panel) and average September temperatures from the surface of Lake Washington, Soos Creek Hatchery, and Issaquah Creek Hatchery from 1972 to 2000 (bottom panel).

the final stages of migration and maturation (Figure 4, bottom panel).

To test for association of temperature with salmon spawning date, we calculated water temperature residuals by taking the difference between the observed mean monthly Lake Washington temperature for each year and the monthly temperature estimated from the regression of temperature against year. The UW Hatchery chinook salmon spawning date residuals (i.e., difference between the mean annual spawning date and the date predicted by the overall trend) were positively correlated with the temperature residuals. That is, the salmon tended to spawn later when the water was warmer in September (P = 0.002,  $r^2 = 0.21$ ; Figure 5) and October  $(P = 0.011, r^2 = 0.15)$ . No correlations were observed with August and November temperature residuals. The UW Hatchery coho salmon spawning date residuals were not corre-

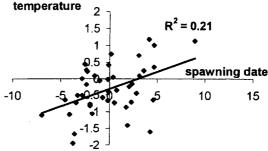


FIGURE 5.—Correlation between the residuals of September Lake Washington water temperature and mean chinook salmon spawning date after eliminating the time trends in the data sets (N=42). Positive residuals correspond to warmer-than-average temperatures and later-than-average spawning dates; see text for details of calculations.

lated with the temperature residuals for any month from August through November (P > 0.10 in all cases).

The temperatures at the Issaguah Creek and Soos Creek hatcheries were much cooler throughout the year than the Lake Washington temperatures (Figure 4, top panel). However, Issaquah Creek was significantly warmer than Soos Creek, based on daily temperatures averaged from 1984 to 2000 (Issaguah Creek annual mean = 10.16°C; Soos Creek mean =  $9.83^{\circ}$ C; paired t-test: t =12.82, P < 0.001). The difference between creeks was most pronounced in the summer and declined in fall and winter. Issaquah Creek was warmer than Soos Creek by 1.02°C in September, 0.66°C in October, 0.46°C in November, and 0.31°C in December. As with Lake Washington, an increasing temperature trend was observed in both creeks since 1972 (Issaquah Creek P = 0.036,  $r^2 = 0.15$ ; Soos Creek P = 0.005,  $r^2 = 0.25$ ; Figure 4, bottom panel).

# Discussion

Salmonids have evolved spawning dates that are appropriate for the regimes of temperature and other environmental factors that prevail during incubation (Ricker 1972; Brannon 1987; Murray et al. 1990; Webb and McLay 1996; Quinn et al. 2000). The ocean-type chinook salmon that predominate in the Puget Sound region typically spawn earlier than coho salmon (Weitkamp et al. 1995; Myers et al. 1998), and the same pattern was observed at all three hatcheries. Coho salmon spawn in small streams, where low flow rates and high water temperatures may constrain them from entering or spawning in early fall. Chinook salmon

usually spawn in larger rivers, where they are less frequently affected by these conditions. Coho salmon seem to compensate for the later spawning by developing faster at a given temperature than chinook salmon (Murray and McPhail 1988; Murray et al. 1990), and also spend a year in freshwater prior to seaward migration.

Superimposed on these species-specific patterns was the trend towards earlier spawning by both salmon species at all three hatcheries, which has probably resulted from several indirect and direct processes. First, natural selection against early spawning from redd disturbance (e.g., van den Berghe and Gross 1989; McPhee and Quinn 1998) is relaxed in the hatchery because the embryos are protected. Second, early-emerging juveniles are fed and protected in a hatchery, whereas those emerging too early in a stream may encounter limited food and waiting predators, so another form of selection against early spawning is relaxed. Third, juveniles produced by late-spawning females may not reach a suitable size for smolt transformation or marine survival (Holtby et al. 1990), and therefore may be selectively culled at the hatchery or may experience low survival rates after release. This factor may be particularly important for the UW Hatchery coho salmon, which must grow fast enough to make the transition to seawater by the end of their first spring. Offspring of female coho salmon spawning in January and February are unlikely to grow and survive at comparable rates to those of earlier spawners, given this constraint. Early experiments on coho salmon at the UW Hatchery by Feldmann (1974) indicated both higher postrelease survival of progeny from early spawners, and a tendency of the spawning date of progeny to reflect the parental spawning date. However, survival is a complex function of release date as well as of size, so the largest smolts may not always experience the highest survival rates after release (e.g., coho salmon in British Columbia [Bilton et al. 1982] and UW chinook salmon [Whitman 1987]). Moreover, late-emerging fry are fed heavily in hatcheries and may catch up to fry that emerged earlier (Unwin et al. 2000), reducing the advantage of early fry.

In addition to indirect forms of selection for spawning date in hatcheries, direct selection exists as well. Hatchery managers commonly spawn all of the earliest salmon that mature, whereas latermaturing fish may be sacrificed or released into the river when the facility's capacity has been reached. Despite efforts to avoid this practice and spawn representative fish over the whole run, some

selection has likely taken place. Given the strong genetic control over migration and maturation date (e.g., Quinn et al. 2000), it is not surprising that hatcheries have advanced the timing of spawning (Flagg et al. 1995; our data). Interestingly, there is evidence that the arrival date (as opposed to spawning date) of chinook salmon at the Soos Creek Hatchery was getting earlier even prior to the years we examined (1944–1965; Miller and Stauffer 1967).

The data not only reveal differences in spawning date between species and trends towards earlier timing at all three hatcheries, but they also show patterns of timing variation among populations. The Soos Creek Hatchery chinook salmon spawned the earliest, followed by Issaquah Creek and then UW chinook salmon. The order of spawning is consistent with the thermal regimes: coolest at Soos Creek Hatchery then Issaquah Creek Hatchery, and warmest at UW Hatchery. The difference in timing among populations was less pronounced in coho salmon. In the early years, coho salmon spawned earlier at Issaquah Creek Hatchery than Soos Creek Hatchery, but the populations converged and are similar at present. Differences between the two species are consistent with the fact that differences in the thermal regimes at Soos and Issaquah creeks were greater in early fall, when chinook salmon spawn, than when coho salmon spawn. The differences in timing among the hatchery populations are noteworthy, given that these are not pure, isolated demes. Rather, exchanges of fish among these and other hatcheries within (and even beyond) Puget Sound have occurred at various times over the years.

The divergence of spawning date, a trait closely linked to fitness, in hatchery populations is an important consideration for genetic and ecological interactions between wild and hatchery-produced salmon (Waples 1991; Utter 1998). The trends in coho salmon spawning timing at UW Hatchery and Soos Creek Hatchery, the primary source population, provide insights into this process. The timing of coho salmon spawning at the two hatcheries was similar in the years when the transplant took place, but at present, the coho salmon spawn later at UW than at Soos Creek. Differences in timing may have resulted from adaptation to the respective thermal regimes (colder at Soos Creek than UW) or from differences in the intensity of selection. In any case, the recent divergence of timing indicates that the two populations are evolving, but at different rates. The similarity in timing in the years when the transplant took place suggests that the UW Hatchery coho salmon population was founded by representative fish from the Soos Creek Hatchery population. In contrast, chinook salmon at the UW and Soos Creek hatcheries differed in timing even in the early 1960s, indicating that either the UW fish rapidly diverged from the Soos Creek population in the years immediately following the transplant, or the salmon used to found the UW population were from the late part of the Soos Creek run.

In addition to selection in hatcheries, changing environmental conditions also select for timing. The migratory timing of sockeye salmon O. nerka in the Columbia River indicated both short-term (year-to-year) responses to changing temperature and flow conditions and a long-term trend consistent with genetic adaptation to the river's increased temperatures and reduced flows (Quinn and Adams 1996; Quinn et al. 1997). Lake Washington, Soos Creek, and Issaquah Creek have been getting warmer in the summer and fall over the past three decades, and the warming trend would be expected to select for later timing of migration and spawning. Thus, the advanced spawning date at all three hatcheries has occurred despite water temperature changes, not as a consequence of them. Warm temperatures likely provide a natural check against early spawning at the UW Hatchery because temperatures in early October (>15°C) approach lethal levels for chinook salmon and coho salmon embryos (Murray and McPhail 1988). However, the influence of ambient temperature has been weakened to some extent by the use of chilled water to improve survival rates of embryos from the earliest spawning chinook salmon at UW Hatchery.

The warming thermal regime in Lake Washington has not overcome the apparent selection in the hatchery for earlier spawning timing, but it was still evident in the correlation between the residuals of spawning and temperature (adjusted for the long-term trends). The correlation was significant for chinook salmon and strongest for the months of September and October, when chinook salmon would likely be migrating and entering the hatchery. The chinook salmon spawn soon after they enter the hatchery, which means that thermal effects on migration would also be correlated with spawning date. Because coho salmon, on the other hand, remain in the hatchery for about a month prior to spawning, factors affecting migration (e.g., temperature) might be less strongly correlated with spawning. In addition, coho salmon spawn later in fall than chinook salmon, when tem-

peratures are cooler and the effects of lake warming might be less critical.

# Acknowledgments

The UW Hatchery and the extensive records available for our analysis resulted from the efforts and foresight of Lauren Donaldson, and we dedicate this paper to him. We thank Metro King County and the PRISM (Puget Sound Regional Synthesis Model) program at the University of Washington for funding this project, and Douglas Houck and Jeffrey Richey for their interest and encouragement. We thank the staff members who collected the data, especially Glenn Yokoyama, Vu The Tru, and Mark Tetrick, and Eric Tilkens for help with data entry. Daniel Schindler (University of Washington Zoology Department) and the Soos Creek Hatchery and Issaquah Creek Hatchery staff (Washington Department of Fish and Wildlife) provided access to records on spawning date and temperature.

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598 QUINN ET AL.

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180

TABLE 3-3 Relative Sources of Parameters of Concern for Different Land Uses in Urban Areas

Problem Parameter	Residential	Commercial	Industrial	Freeway	Construction	
High flow rates (energy)	Low	High	Moderate	High	Moderate	
Large runoff volumes	Low	High	Moderate	High	Moderate	
Debris (floatables and gross solids)	High	High	Low	Moderate	High	
Sediment	Low	Moderate	Low	Low	Very high	
Inappropriate discharges (mostly sewage and cleaning wastes)	Moderate	High	Moderate	Low	Low	
Microorganisms	High	Moderate	Moderate	Low	Low	
Toxicants (heavy metals/organics)	Low	Moderate	High	High	Moderate	
Nutrients (eutrophication)	Moderate	Moderate	Low	Low	Moderate	
Organic debris (SOD and DO)	High	Low	Low	Low	Moderate	
Heat (elevated water temperature)	Moderate	High	Moderate	High	Low	

NOTE: SOD, sediment oxygen demand; DO, dissolved oxygen.

SOURCE: Summarized from Burton and Pitt (2002), Pitt et al. (2008), and CWP and Pitt (2008).

runoff are controlled largely by the increase in volume and the washoff of pollutants from impervious surfaces. Stormwater in this phase is associated with increases in discharges of most pollutants, but with less sediment washoff than from construction and likely less sediment and nutrient discharges compared to any pre-urbanization agricultural operations (although increased channel erosion may increase the mass of sediment delivered in this phase; Pitt et al., 2007). A third significant urban land use is industrial activity. As described later, industrial site stormwater discharges are highly variable, but often greater than other land uses.

# **Construction Site Erosion Characteristics**

Problems associated with construction site runoff have been known for many years. More than 25 years ago, Willett (1980) estimated that approximately 5 billion tons of sediment reached U.S. surface waters annually, of which 30 percent was generated by natural processes and 70 percent by human activities. Half of this 70 percent was attributed to eroding croplands. Although construction occurred on only about 0.007 percent of U.S. land in the 1970s, it ac-

# Managing Urban Runoff What Homeowners Can Do

To decrease polluted runoff from paved surfaces, households can develop alternatives to areas traditionally covered by impervious surfaces. Porous pavement materials are available for driveways and sidewalks, and native vegetation and mulch can replace high maintenance grass lawns. Homeowners can use fertilizers sparingly and sweep driveways, sidewalks, and roads instead of using a hose. Instead of disposing of yard waste, they can use the materials to start a compost pile. And homeowners can learn to use Integrated Pest Management (IPM) to reduce dependence on harmful pesticides.

In addition, households can prevent polluted runoff by picking up after pets and using, storing, and disposing of chemicals properly. Drivers should check their cars for leaks and recycle their motor oil and antifreeze when these fluids are changed. Drivers can also avoid impacts from car wash runoff (e.g., detergents, grime, etc.) by using car wash facilities that do not generate runoff. Households served by septic systems should have them professionally inspected

and pumped every 3 to 5 years. They should also practice water conservation measures to extend the life of their septic systems.

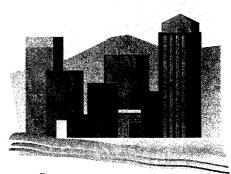
# Controlling Impacts from New Development

Developers and city planners should attempt to control the volume of runoff from new development by using low impact development, structural controls, and pollution prevention strategies. Low impact development includes measures that conserve natural areas (particularly sensitive hydrologic areas like riparian buffers and infiltrable soils); reduce development impacts; and reduce site runoff rates by maximizing surface roughness, infiltration opportunities, and flow paths.

# Controlling Impacts from Existing Development

Controlling runoff from existing urban areas is often more costly than controlling runoff from new developments. Economic efficiencies are often realized through approaches that target "hot spots" of runoff pollution or have multiple benefits, such as high-efficiency street sweeping (which addresses aesthetics, road safety,

and water quality). Urban planners and others responsible for managing urban and suburban areas can first identify and implement pollution prevention strategies and examine source control opportunities. They should seek out priority pollutant reduction opportunities, then protect natural areas that help control runoff, and finally begin ecological restoration and retrofit activities to clean up degraded water bodies. Local governments are encouraged to take lead roles in public education efforts through public signage, storm drain marking, pollution prevention outreach campaigns, and partnerships with citizen groups and businesses. Citizens can help prioritize the clean-up strategies, volunteer to become involved in restoration efforts, and mark storm drains with approved "don't dump" messages.



# Related Publications

Turn Your Home into a Stormwater Pollution Solution! www.epa.gov/nps

This web site links to an EPA homeowner's guide to healthy habits for clean water that provides tips for better vehicle and garage care, lawn and garden techniques, home improvement, pet care, and more.

# National Management Measures to Control Nonpoint Source Pollution from Urban Areas

www.epa.gov/owow/nps/urbanmm

This technical guidance and reference document is useful to local, state, and tribal managers in implementing management programs for polluted runoff. Contains information on the best available, economically achievable means of reducing pollution of surface waters and groundwater from urban areas.

# Onsite Wastewater Treatment System Resources www.epa.gov/owm/onsite

This web site contains the latest brochures and other resources from EPA for managing onsite wastewater treatment systems (OWTS) such as conventional septic systems and alternative decentralized systems. These resources provide basic information to help individual homeowners, as well as detailed, up-to-date technical guidance of interest to local and state health departments.

# Low Impact Development Center www.lowimpactdevelopment.org

This center provides information on protecting the environment and water resources through integrated site design techniques that are intended to replicate preexisting hydrologic site conditions.

# Stormwater Manager's Resource Center (SMRC) www.stormwatercenter.net

Created and maintained by the Center for Watershed Protection, this resource center is designed specifically for stormwater practitioners, local government officials, and others that need technical assistance on stormwater management issues.

# Strategies: Community Responses to Runoff Pollution www.nrdc.org/water/pollution/storm/stoinx.asp

The Natural Resources Defense Council developed this interactive web document to explore some of the most effective strategies that communities are using around the nation to control urban runoff pollution. The document is also available in print form and as an interactive CD-ROM.

# For More Information

U.S. Environmental Protection Agency Nonpoint Source Control Branch (4503T) 1200 Pennsylvania Avenue, NW Washington, DC 20460

# **Design Principles**



# for Stormwater Management on Compacted, Contaminated Soils in Dense Urban Areas

EPA's Brownfields Program is designed to empower states, communities, and other stakeholders in economic redevelopment to work together in a timely manner to prevent, assess, safely clean up, and sustainably reuse brownfields. A brownfield is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. EPA's Brownfields Program provides financial and technical assistance for brownfield revitalization, including grants for environmental assessment, cleanup, and job training.

# What is Green Infrastructure?

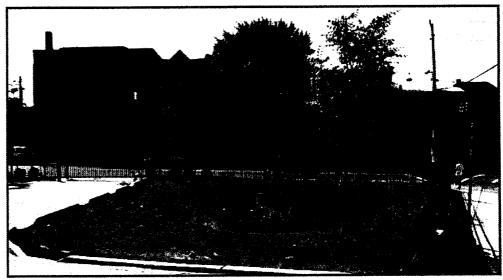
Most development and redevelopment practices cover large areas of the ground with impervious surfaces such as roads, driveways, sidewalks, and new buildings themselves, which then prevent rainwater from soaking into the ground. These hard surfaces increase the speed and amount of stormwater that runs into nearby waterways, carrying pollutants and sediment each time it rains.

Green infrastructure seeks to reduce or divert stormwater from the sewer system and direct it to areas where it can be infiltrated, reused or evapotranspirated. Soil and vegetation are used instead of, or in conjunction with, traditional drains, gutters, pipes and centralized treatment areas. In many new and redevelopment projects, green infrastructure is implemented to manage and mitigate the polluted runoff created by precipitation that falls on rooftops, streets, sidewalks, parking lots and other impervious surfaces.

# How can Green Infrastructure be Applied to Brownfield Sites?

Preparing brownfields for redevelopment often requires capping of contaminated soils, creating even larger impervious surfaces. The challenge for managing stormwater on brownfield sites is allowing this capping while mitigating the impervious surface conditions that can negatively impact local waterways.

Unlike many conventional developments, impervious footprints on brownfields cannot always be minimized through site designs that incorporate more porous surfaces to allow for infiltration. Direct infiltration on a brownfield site may introduce additional pollutant loads to groundwater and nearby surface waters. However, green infrastructure practices exist that can retain, treat and then release stormwater without it ever coming in contact with contaminated soils.



A bioswale in Wilmington, Delaware, designed to absorb and retain stormwater runoff.

The University of Michigan's School of Natural Resources and Environment developed design guidelines that use low impact development techniques on contaminated sites. Using a former industrial site in Flint, Michigan, called Chevy in the Hole, graduate students considered and refined methods to prevent residual contamination from moving with stormwater.

# Blue arrows represent flows of surface and groundwater onto brownfield site

# **Design Considerations**

A key component of using

green infrastructure for brownfield sites is treatment and storage of stormwater, rather than complete infiltration. Most brownfields that have residual contamination need caps, so vegetated areas need to be located above caps and fitted with underdrain systems to remove overflow stormwater.

Development and redevelopment projects should start with keeping existing trees onsite, minimizing compaction of earth that inhibits water infiltration, and planting trees and other vegetation in areas where none exists. Retaining existing tree cover and vegetated areas helps infiltrate and evapotranspirate stormwater runoff while intercepting large amounts of rainfall that would otherwise enter waterways as runoff.

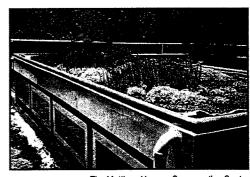
Buildings and other impervious surfaces can be strategically located to act as caps over areas with known contamination. Areas with fill caps can include soils and vegetation above the cap in the form of swales or rain gardens. If fitted with an under-drain system to release treated stormwater off site, these planted areas can safely allow filtration and evapotranspiration of stormwater. Additional features like impermeable liners or gravel filter blankets can be coupled with modified low impact development (LID) practices that safely filter stormwater without exposing the water to contaminated soils.

Green roofs are an ideal way to reduce the runoff from building roofs by encouraging evapotranspiration of rainwater. Another option for brownfield sites is the capture and reuse of stormwater for non-potable uses; this can include runoff storage in rain barrels for irrigation of green roofs or landscaped areas, or in cisterns that store rainwater for toilet flushing and other uses.

Site location within the watershed is very important. In particular, projects in groundwater recharge

areas should avoid low impact development practices that promote infiltration, and use techniques that directly discharge treated stormwater instead. Furthermore, new and redeveloped sites near brownfields should use green infrastructure practices to prevent additional runoff from flowing onto potentially contaminated areas.

Overall, when developing a stormwater management plan on a brownfield, surrounding sites must be considered. (Source: Flint Futures: Alternative Futures for Brownfield Redevelopment in Flint, Michigan.)



The Matthew Henson Conservation Center in Washington, DC, utilizes a green roof.

# General Principles for Using Green Infrastructure on Brownfield Sites

Guideline #1: Differentiate between groups of contaminants as a way to better minimize risks.

Guideline #2: Keep non-contaminated stormwater separate from contaminated soils and water to prevent leaching and spreading of contaminants.

Guideline #3: Prevent soil erosion using vegetation, such as existing trees, and structural practices like swales or sediment basins.

Guideline #4: Include measures that minimize runoff on all new development within and adjacent to a brownfield. These measures include green roofs, green walls, large trees, and rainwater cisterns.

# **Definitions**

Bioswales are open channels with a dense cover of vegetation where runoff is directed or retained to evapotranspirate and filter.

Evapotranspiration is the return of water to the atmosphere either through evaporation or by plants.

Green Infrastructure and Low Impact Development (LID) both refer to systems and practices that use or mimic natural processes to infiltrate, evapotranspirate or reuse stormwater or runoff on the site where it is generated.

Green roofs can be used to effectively reduce or eliminate runoff from small and medium sized storms. A soil mixture is placed over a waterproof membrane and drainage system and then planted with water absorbent and drought tolerant plants. Most systems also have root barriers. These roofs soak up stormwater and release it back into the atmosphere through evaporation and plant respiration, while draining excess runoff.

**Rain gardens** serve the same purpose as stormwater planters and are appropriate where there is more area to plant vegetation. Sizing is dependent on the area of impervious surfaces draining to the rain garden, but they can be designed to only treat a portion of the runoff so they can be placed in most situations.

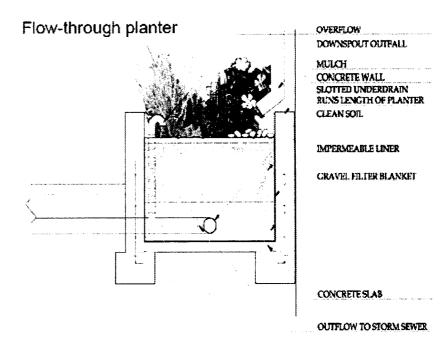
# Stormwater harvest and reuse.

Rainwater harvested in cisterns, rain barrels, or other devices may be used to reduce potable water used for landscape irrigation, fire suppression, toilet and urinal flushing, and custodial uses.

Storage and reuse techniques range from small-scale systems (e.g., rain barrels) to underground cisterns that may hold large volumes of water.

# Stormwater planters.

Downspouts can be directed into stormwater planters. These planters are used to temporarily detain, filter and evapotranspirate stormwater using plant uptake.



# **Additional Resources**

The Emeryville, California Stormwater Guidelines for Green, Dense Redevelopment provides guidance on using vegetative stormwater treatment measures for this dense, brownfield-laden city: <a href="https://www.ci.emeryville.ca.us/planning/stormwater.html">www.ci.emeryville.ca.us/planning/stormwater.html</a>.

EPA's Green Infrastructure Web site (www.epa.gov/npdes/greeninfrastructure) provides definitions, case studies and performance data for various practices that might be applicable to brownfield sites.

The Low Impact Development Center is dedicated to research, development, and training for water resource and natural resource protection issues. The Center focuses specifically on furthering the advancement of Low Impact Development technology: <a href="www.lowimpactdevelopment.org">www.lowimpactdevelopment.org</a>.

Green Roofs for Healthy Cities collects and publishes technical information on green roof products and services: www.greenroofs.org.

The Center for Watershed Protection's Better Site Design Tools provide links to various better site design resources and publications: <a href="https://www.cwp.org/PublicationStore/bsd.htm">www.cwp.org/PublicationStore/bsd.htm</a>.

American Rivers' Catching the Rain: A Great Lakes Resource Guide for Natural Stormwater Management describes a variety of low impact development strategies that can be implemented in a wide range of built environments. Available at: <a href="https://www.americanrivers.org/site/DocServer/CatchingTheRain.pdf?docID=163">www.americanrivers.org/site/DocServer/CatchingTheRain.pdf?docID=163</a>

NRDC's Rooftops to Rivers: Green Strategies for Controlling Stormwater and Combined Sewer Overflows is a policy guide for decision makers looking to implement green strategies in their own area, including nine case studies of cities that have successfully used green techniques to create a healthier urban environment. Available at: <a href="https://www.nrdc.org/water/pollution/rooftops/contents.asp">www.nrdc.org/water/pollution/rooftops/contents.asp</a>

Portland's (Oregon) Trees for Green Streets: An Illustrated Guide is a guidebook that helps communities select street trees that reduce stormwater runoff from streets and improve water quality.

Available at: www.metro-region.org/article.cfm?articleID=263

Seattle's pilot Street Edge Alternatives Project (SEA Streets) is designed to provide drainage that more closely mimics the natural landscape prior to development than traditional piped systems. Good information can be found at: <a href="www.seattle.gov/util/About\_SPU/Drainage\_&\_Sewer\_System/Natural\_Drainage\_Systems/Street\_Edge\_Alternatives/index.asp">www.seattle.gov/util/About\_SPU/Drainage\_&\_Sewer\_System/Natural\_Drainage\_Systems/Street\_Edge\_Alternatives/index.asp</a>

**EPA's** *Protecting Water Resources with Higher-Density Development* report helps communities better understand the impacts of higher and lower density development on water resources. The findings indicate that low-density development may not always be the preferred strategy for protecting water resources. Available at: <a href="www.epa.gov/dced/water\_density.htm">www.epa.gov/dced/water\_density.htm</a>.

Portland Metro's (Oregon) Green Streets: Innovative Solutions for Stormwater and Stream Crossings is a handbook that describes stormwater management strategies and includes detailed illustrations of "green" street designs that allow infiltration and limit stormwater runoff.

Available at www.metro-region.org/article.cfm?articleID=262

**EPA's** Protecting Water Resources with Smart Growth is a report intended for audiences already familiar with smart growth concepts who seek specific ideas on how techniques for smarter growth can be used to protect water resources. The report describes 75 policies that communities can use to grow in the way that they want while protecting their water quality. Available at: <a href="www.epa.gov/dced/water\_resource.htm">www.epa.gov/dced/water\_resource.htm</a>

EPA's Using Smart Growth Techniques as Stormwater Best Management Practices reviews nine common smart growth techniques and examines how they can be used to prevent or manage stormwater runoff. Available at: <a href="https://www.epa.gov/dced/stormwater.htm">www.epa.gov/dced/stormwater.htm</a>

**EPA's** Brownfields Program Website (www.epa.gov/brownfields) provides information on and resources for assessing, cleaning up and redeveloping brownfields, including grant funding opportunities.



# **Case Studies**



# for Stormwater Management on Compacted, Contaminated Soils in Dense Urban Areas

EPA's Brownfields Program is designed to empower states, communities, and other stakeholders in economic redevelopment to work together in a timely manner to prevent, assess, safely clean up, and sustainably reuse brownfields. A brownfield is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. EPA's Brownfields Program provides financial and technical assistance for brownfield revitalization, including grants for environmental assessment, cleanup, and job training.

#### What is Green Infrastructure?

Most development and redevelopment practices cover large areas of the ground with impervious surfaces such as roads, driveways, sidewalks and new buildings themselves, which then prevent rainwater from soaking into the ground. These hard surfaces increase the speed and amount of stormwater that runs into nearby waterways, carrying pollutants and sediment each time it rains.

Green infrastructure seeks to reduce or divert stormwater from the sewer system and direct it to areas where it can be infiltrated, reused or evapotranspirated. Soil and vegetation are used instead of, or in conjunction with, traditional drains, gutters, pipes and centralized treatment areas. In many new and redevelopment projects, green infrastructure is implemented to manage and mitigate the polluted runoff created by precipitation that falls on rooftops, streets, sidewalks, parking lots and other impervious surfaces.

### How can Green Infrastructure be Applied to Brownfield Sites?

Brownfields redevelopment and sustainable stormwater management both produce economic and environmental benefits by improving urban areas, protecting open space and preventing further pollution of the nation's waters. However, in order to prevent further environmental damage by infiltrating precipitation through contaminated soil, onsite stormwater management must be done carefully, using particular design guidelines. There are projects across the country that have found effective solutions to the challenge of developing a brownfield site with residual contamination, by incorporating appropriate natural systems for stormwater management.

### Greening Old Industrial Lands in Emeryville, California

Emeryville, California occupies just 1.2 square miles of dense, formerly industrial land along the San Francisco Bay between Berkeley and Oakland. In the 1990s, Emeryville started a comprehensive brownfields redevelopment project to address serious economic and social costs associated with large tracts of vacant or underutilized non-residential property throughout the city. The redevelopment of several targeted brownfields had many positive outcomes for the city, such as new jobs and residents, and increased income and tax revenue, but also had negative environmental impacts by increasing overall impervious surfaces contributing to runoff and non-point source pollution.



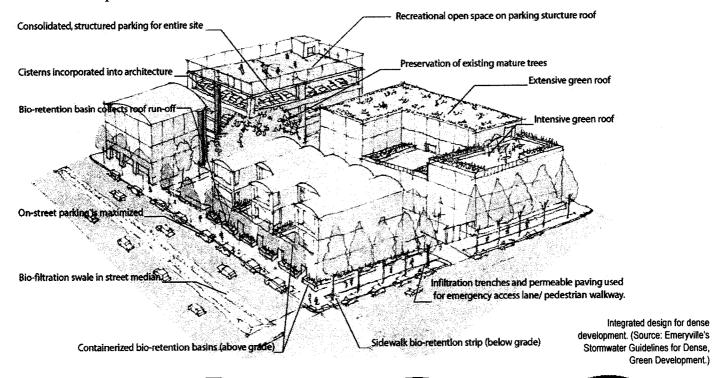
The Green City Lofts in Emeryville, California.

Stormwater solutions for brownfields with residual contamination often require that no surface water infiltrates the soil. This works fine in most settings where there is more space, particularly uncontaminated space available for diversion, retention and treatment. Emeryville was not able to adopt other cities' stormwater strategies because of the compacted, contaminated soils within its dense, high-value urban area. In 2004, Emeryville received a Smart Growth grant from the U.S. EPA to create local sustainable solutions to brownfield redevelopment. In 2005, Emeryville City Council adopted Stormwater Guidelines for Dense, Green Development that apply to development projects of 10,000 square feet or more. These guidelines emphasize site design that uses vegetated stormwater management practices and integrates parking strategies that reduce the total number of parking spaces required in the community by way of shared parking, making the best use of on-street parking, and pricing strategies. Emeryville's Stormwater Guideline's for Dense, Green Development can be found at: <a href="https://www.ci.emeryville.ca.us/planning/pdf/stormwater\_guidelines.pdf">www.ci.emeryville.ca.us/planning/pdf/stormwater\_guidelines.pdf</a>.

Emeryville's solutions encourage minimizing total impervious area and managing stormwater onsite to prevent surface run-off. The guidelines suggest a range of design options that can stand alone or be combined into an integrated approach. Tree preservation and planting with structured soils work well within the space constraints of parking lots, sidewalks and dense development. Green roofs can either be extensive or intensive to manage rainfall through evapotranspiration and bio-filtration. Stormwater reuse is another creative way to manage stormwater in dense urban areas. Cisterns placed above or below ground are suggested for water storage and reuse of rainwater for irrigation and other non-potable uses. Green City Lofts, a 62-unit multifamily development in Emeryville, reuses stormwater for irrigation on the site of a former paint facility contaminated with petroleum hydrocarbons.

Detention, retention, and biofiltration are suitable for contaminated sites because they prevent exfiltration to underlying soils and allow adequate time for water to be in contact with plants and trees for bioremediation. Infiltration trenches and basins collect stormwater and infiltrate or attenuate runoff and may also use filter devices for pre-treatment. Permeable pavement and rain gardens are not usually suitable for sites with residual contamination, but Emeryville's Stormwater Guidelines suggest that in these circumstances, the area be capped and the stormwater retention vault below the permeable surface lined and fitted with under-drains connected to the storm sewer system.

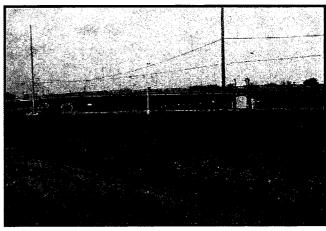
Almost all of the solutions outlined in Emeryville's Stormwater Guidelines confer a range of additional benefits of green infrastructure beyond improved water quality and ecosystem health, including unique and attractive streetscapes, additional recreation and open space, as well as helping the city to be more competitive in attracting further housing and business development.



# From Model A to a Model of Redevelopment in Dearborn, MI

Built by Henry Ford in the 1920s, the Rouge Truck Manufacturing Complex was a marvel of industrial efficiency. Raw materials went into one end of the plant and completed vehicles came out the other. Over time, the area devolved into a brownfield and in 2000, the Ford Motor Company began a project to redevelop the plant as a model of sustainable manufacturing.

The centerpiece of stormwater management at this industrial area is a 10-acre green roof that can retain approximately 50% of precipitation falling onto it. Additionally, it decreases the building's energy costs and will likely double the roof's lifespan. Other stormwater features include collection of excess runoff and its reuse throughout the plant. Porous



The former Rouge Truck Factory in Dearborn, Michigan utilizes landscaped swales and wetlands containing native plants, bushes, and trees to remediate soils.

pavement allows water to drain through to a filter system that improves quality before being used elsewhere.

Landscaped swales and wetlands containing native plants, bushes, and trees remediate the soils surrounding the building by taking up, sequestering, and even treating pollutants that accumulated during more than 80 years of manufacturing. This vegetation also provides valuable habitat for wildlife and helps to cleanse water before it enters the nearby Rouge River. Water quality monitoring data show increased levels of dissolved oxygen necessary for fish and other species to thrive. Bacteria levels are also declining, which is beneficial not only to fish but to the increasing numbers of people who enjoy spending time on the river.

### Toxic Steel Residue Gives Way to New Residences for Pittsburgh, PA

Four miles from downtown Pittsburgh, on a 238-acre parcel adjacent to Nine Mile Run, a brownfield has been redeveloped into the residential area known as Summerset at Frick Park. Over \$300,000 in EPA Brownfields Assessment funds were used to survey the area, which once held piles of slag—a by-product of combusting coal to create steel.

Summerset at Frick Park features 713 housing units with 336 single-family homes, 121 townhouses, and 256 apartment units. In the process, Nine Mile Run, the last free-flowing stream in the City of Pittsburgh, was transformed as well.

Summerset at Frick Park in Pittsburgh, Pennsylvania, built on a former brownfield.

Degraded by sewage and high-alkaline seeps from the accumulated slag, this urban stream has undergone a renaissance. On-site soils were blended with granular slag, wood chips and fertilizers and used to plant steep slopes with grasses and legumes. Trees tolerant of high pH and compaction were also used to populate the stream banks

The project increased the city's green space, and created new trails connecting Frick Park to the Monongahela River. It provided new housing without sacrificing natural space or resources. The community also enjoys improved river access, enhanced tax revenues, a beautified landscape, and new recreational opportunities.

#### **Definitions**

**Bioswales** are open channels with a dense cover of vegetation where runoff is directed or retained to evapotranspirate and filter.

Evapotranspiration is the return of water to the atmosphere either through evaporation or by plants.

Green Infrastructure and Low Impact Development (LID) both refer to systems and practices that use or mimic natural processes to infiltrate, evapotranspirate or reuse stormwater or runoff on the site where it is generated.

Green roofs can be used to effectively reduce or eliminate runoff from small and medium sized storms. A soil mixture is placed over a waterproof membrane and drainage system and then planted with water absorbent and drought tolerant plants. Most systems also have root barriers. These roofs soak up stormwater and release it back into the atmosphere through evaporation and plant respiration, while draining excess runoff.

**Rain gardens** serve the same purpose as stormwater planters and are appropriate where there is more area to plant vegetation. Sizing is dependent on the area of impervious surfaces draining to the rain garden, but they can be designed to only treat a portion of the runoff so they can be placed in most situations.

Stormwater harvest and reuse. Rainwater harvested in cisterns, rain barrels, or other devices may be used to reduce potable water used for landscape irrigation, fire suppression, toilet and urinal flushing, and custodial uses. Storage and reuse techniques range from small-scale systems (e.g., rain barrels) to underground cisterns that may hold large volumes of water.

Stormwater planters. Downspouts can be directed into stormwater planters. These planters are used to temporarily detain, filter and evapotranspirate stormwater using plant uptake.

#### Additional Resources

The Emeryville, California Stormwater Guidelines for Green, Dense Redevelopment provides guidance on using vegetative stormwater treatment measures for this dense, brownfield-laden city: <a href="https://www.ci.emeryville.ca.us/planning/stormwater.html">www.ci.emeryville.ca.us/planning/stormwater.html</a>.

EPA's Green Infrastructure Web site (www.epa.gov/npdes/greeninfrastructure) provides definitions, case studies and performance data for various practices that might be applicable to brownfield sites.

The Low Impact Development Center is dedicated to research, development, and training for water resource and natural resource protection issues. The Center focuses specifically on furthering the advancement of Low Impact Development technology: www.lowimpactdevelopment.org.

Green Roofs for Healthy Cities collects and publishes technical information on green roof products and services: www.greenroofs.org.

The Center for Watershed Protection's Better Site Design Tools provide links to various better site design resources and publications: <a href="https://www.cwp.org/PublicationStore/bsd.htm">www.cwp.org/PublicationStore/bsd.htm</a>.

American Rivers' Catching the Rain: A Great Lakes Resource Guide for Natural Stormwater Management describes a variety of low impact development strategies that can be implemented in a wide range of built environments. Available at: <a href="https://www.americanrivers.org/site/DocServer/CatchingTheRain.pdf?docID=163">www.americanrivers.org/site/DocServer/CatchingTheRain.pdf?docID=163</a>

EPA's Brownfields Program Website (www.epa.gov/brownfields) provides information on and resources for assessing, cleaning up and redeveloping brownfields, including grant funding opportunities.

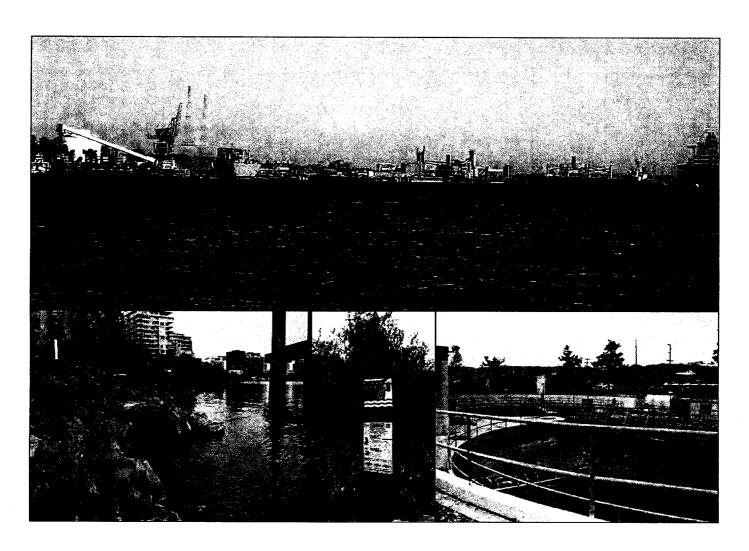


Case Studies for Stormwater Management on Compacted, Contaminated Soils in Dense Urban Areas Solid Waste and Emergency Response (5105T) EPA-560-F-07-232 April 2008 www.epa.gov/brownfields



Prepared in cooperation with the Columbia River Inter-Tribal Fish Commission and the Lower Columbia Estuary Partnership

Reconnaissance of Contaminants in Selected Wastewater-Treatment-Plant Effluent and Stormwater Runoff Entering the Columbia River, Columbia River Basin, Washington and Oregon, 2008–10



Scientific Investigations Report 2012–5068

#### Oil and Grease

Oil and grease concentrations in this study were consistent and near or less than the reporting limit (table 24). The only location where concentrations were greater than the reporting limit was Willamette2. Analytical difficulties with these analyses caused method blanks often to show concentrations equal to one-half or more of the concentration in the environmental sample.

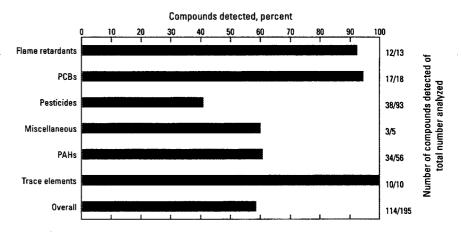
#### **Synopsis**

The overall percentage of compounds detected in the stormwater-runoff samples (58 percent, or 114 of 195, fig. 5) was very similar to the percentage detected in WWTP-effluent samples (53 percent, or 112 of 120, fig. 3). The difference for stormwater is that the compounds detected were not similar across locations. Trace elements were detected at all sites and at levels of concern for the health of aquatic biota. All of the other compound classes were dominated by a few samples with high suspended-sediment concentrations— Umatilla, Willamette3, and Willamette2. The suspended-sediment contribution alone could not account for the large number and elevated concentrations measured at the Willamette2 site. Landuse sources in the drainage area play a key role at this site, which is located within an EPA Superfund project area. Two of the ubiquitous compound classes detected in the stormwater runoff, trace elements and PAHs, are related to automobiles and impervious surfaces, typical findings for stormwater runoff in urban areas.

**Table 24.** Oil and grease detected in stormwater runoff, Columbia River Basin, Washington and Oregon, 2009–10.

[Station names are shown in <u>table 3</u>. Concentrations are in milligrams per liter. **Abbreviations:** –, not detected; E, estimated]

Short name	Date	Time	Reporting limit	Concentration in sample	Concentration in method blank
Wenatchee	12-21-09	1340	5.0	-	_
Richland	05-02-09	1200	5.0	E 4.4	E 1.5
Umatilla	10-04-09	0920	5.0	E 4.4	E 2.4
The Dalles	02-23-09	1210	5.0	E 3.5	E 2.1
Hood River	02-23-09	1310	5.0	E 4.1	E 2.1
Portland1	10-14-09	1100	5.0	E 4.8	E 2.3
Vancouver1	12-16-09	1340	5.0	E 2.3	_
Vancouver2	12-16-09	1210	5.0	E 3.3	_
Portland2	10-26-09	1210	5.0	E 3.6	_
Willamette1	06-04-10	0840	4.7	E 4.0	E 3.4
Willamette2-Dec	12-15-09	1330	5.0	5.6	_
Willamette2-May	05-26-10	1310	5.4	6.7	E 3.6
Willamette3	12-15-09	1310	5.0	_	_
Willamette4	05-26-10	1410	5.5	4.1	_
St Helens	03-30-10	1310	4.7	E 2.5	E 1.7
Longview	03-30-10	1410	4.7	E 2.5	E 1.7



**Figure 5.** Percentage of compounds detected in stormwater runoff, Columbia River Basin, Washington and Oregon, 2009–10.

# Attachment A Guidance for Documenting and Reporting the Superfund Sitewide Ready-for-Reuse Performance Measure

#### I. Purpose

The purpose of this guidance is to assist EPA managers and staff in fulfilling the Agency's GPRA responsibilities for documenting and reporting Superfund accomplishments in making National Priorities List (NPL) sites ready for reuse. It provides information for identifying, documenting and reporting construction complete Superfund NPL sites where the entire land portion of the site is being used, or has been made ready for use in the future, in a protective fashion.

#### II. Overview

The Office of Superfund Remediation and Technology Innovation (OSRTI), in coordination with the Federal Facilities Restoration and Reuse Office (FFRRO), has developed a new performance measure to report the Superfund program's accomplishments in making land ready for reuse at construction complete sites. This measure is included along with other Superfund measures as part of the Environmental Protection Agency's FY 2006 - 2011 Strategic Plan. All such performance measures have both annual and long-term cumulative targets.

The new Sitewide Ready-for-Reuse Superfund performance measure is:

The number of final and deleted construction complete National Priorities List (NPL) sites where, for the entire site,

- (1) All cleanup goals in the Record(s) of Decision or other remedy decision document(s) have been achieved for media that may affect current and reasonably anticipated future land uses of the site, so that there are no unacceptable risks; and
- (2) All institutional or other controls required in the Record(s) of Decision or other remedy decision document(s) have been put in place.

The Sitewide Ready-for-Reuse measure was developed to comply with the Agency's responsibility to report long-term outcome-based accomplishments under the Government Performance and Results Act (GPRA). The introduction of this measure also reflects the high priority EPA places on land revitalization as an integral part of the Agency's cleanup mission for the Superfund program, as well as the priority EPA is now placing on post-construction activities at NPL sites.

Regions will begin documenting this information and reporting on the Sitewide Readyfor-Reuse measure in CERCLIS in FY 2007, as sites are identified in accordance with this guidance.

#### III. Background

EPA places a high priority on land revitalization as an integral part of its Superfund response program mission. The Agency's policies have increasingly addressed the issue of making Superfund NPL sites protective for current and future users. For example, one of EPA's key responsibilities under CERCLA is to ensure that contaminated property owned by the Federal government is environmentally suitable for transfer or lease. EPA has been involved in making environmental determinations pertaining to site use since the first BRAC legislative action in 1988, and continues to ensure protective use at both operating and closed Federal facilities undergoing CERCLA environmental response actions.<sup>1</sup>

Building on its experience supporting reuse at Superfund sites, in 1999 EPA created the Superfund Redevelopment Initiative<sup>2</sup> to help communities and other stakeholders in their efforts to return Superfund NPL sites to productive use. In April 2003, EPA announced its Land Revitalization Action Agenda,<sup>3</sup> a plan for addressing the nation's contaminated lands to enable their reuse by communities. Building on this framework, in November 2004, the Agency developed the programmatic performance measures described in the Superfund Revitalization Performance Measures guidance,<sup>4</sup> which serve to report the progress of EPA's activities in making Superfund NPL sites ready for their anticipated future use.

In addition, this new Sitewide Ready-for-Reuse measure directly supports the *National Strategy to Manage Post Construction Completion Activities at Superfund Sites*<sup>5</sup> (PCC Strategy) by providing the Program with a way to assess its effectiveness in conducting post-construction completion activities.

<sup>1</sup> Nothing in this guidance alters or affects the legal requirements related to property transferred by Federal agencies pursuant to CERCLA 120(h), nor does it alter or affect EPA guidance documents related to Federal real property transfer or lease.

<sup>2</sup> See EPA's Superfund Redevelopment Initiative (SRI) web site at <a href="http://epa.gov/superfund/programs/recycle/index.htm">http://epa.gov/superfund/programs/recycle/index.htm</a>

<sup>3</sup> The Land Revitalization Action Agenda at <a href="http://www.epa.gov/oswer/LANDREVITALIZATION/agenda\_full.htm">http://www.epa.gov/oswer/LANDREVITALIZATION/agenda\_full.htm</a>.

<sup>4</sup> See Guidance for Documenting and Reporting the Superfund Revitalization Performance Measures, OSWER 9202.1-26, November 5, 2004

<sup>5</sup> See EPA's PCC Strategy at <a href="http://www.epa.gov/superfund/action/postconstruction/pcc\_strategy\_final.pdf">http://www.epa.gov/superfund/action/postconstruction/pcc\_strategy\_final.pdf</a>.

#### IV. Sitewide Ready-for-Reuse Selection Elements

The Sitewide Ready-for-Reuse measure reports sites documented as ready for reuse where for the entire construction complete NPL site:

- All cleanup goals in the Record(s) of Decision or other remedy decision document(s) have been achieved for media that may affect current and reasonably anticipated future land uses of the site, so that there are no unacceptable risks; and
- All institutional or other controls required in the Record(s) of Decision or other remedy decision document(s) have been put in place.

Controls in Place: In order for a site to be qualified under this measure, all controls (engineered as well as institutional) used as part of the justification for considering that a site is Sitewide Ready-for-Reuse must be in place. Depending on the type of institutional controls used at a site, the term "in place" could include, for example: the enactment of ordinances (e.g., ground water use restrictions), codes, or other regulations by local government; recording of legal instruments in the chain of title for a property; issuance by a regulatory authority of enforcement tools or permits; agreements between the regulatory authority and the property owners or facility operators; listing of property on a state registry of contaminated sites; recording of deed notices or hazard advisories in local land records; and for active military bases, use of base master plan, instructions, orders, and dig permit systems.

Human Exposure Under Control: The Superfund program also reports on another NPL sitewide measure, Human Exposure Under Control. The Human Exposure determination for sites that qualify for the Sitewide Ready-for-Reuse measure should either be:

- "Current Human Exposure Controlled and Protective Remedy in Place"; or
- "Long-Term Human Health Protection Achieved"

Human exposure site determinations that are not one of the two categories above are inconsistent with the requirements that must be met for the Sitewide Ready-for-Reuse measure.

Ecological exposures: If cleanup goals were established in the Record(s) of Decision or other remedy decision document(s) for ecological exposures, they must also be met for the site to be designated Sitewide Ready-for-Reuse.

Determining Which Media Affect Current and Reasonably Anticipated Future Land Uses: Any media that may affect current and reasonably anticipated future land uses should be considered when making the Sitewide Ready-for-Reuse designation. The NCP (40 CFR 300.5) defines 'on-site' to mean "the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for the implementation of a response action." If media such as wetlands, surface water bodies, sediments, and groundwater may pose an unacceptable

risk to areas of current and reasonably anticipated future land use, cleanup goals for these media must be set and met before declaring the site to be Sitewide Ready-for-Reuse.

#### V. Implementation

Beginning in Fiscal Year 2007, Regions will report on the Sitewide Ready-for-Reuse measure. To establish a national baseline, Regions must review site data to determine which sites currently meet the selection elements outlined in this guidance. These sites will form the baseline against which future performance will be measured. Upon establishment of the baseline, annual and long-term targets will be set to evaluate the Agency's performance. EPA will be expected to report on the progress of this measure in achieving those targets externally to the Office of Management and Budget, and to Congress.

Attached to this guidance is a Sitewide Ready-for-Reuse Checklist for documenting and reporting this new measure. The Sitewide Ready-for-Reuse measure is for construction complete Superfund final and deleted NPL sites only. Regions will submit completed Checklists for the Sitewide Ready-for-Reuse measure to Headquarters for approval before the reported site may be counted to meet the GPRA target for this measure.

The new Sitewide Ready-for-Reuse measure will supplement, not replace, the previous reporting measures: "Acres Ready for Reuse" and "Sites with Land Ready for Reuse." The Superfund program will continue to report "Acres Ready for Reuse" and "Sites with Land Ready for Reuse" for the Agency's own internal management purposes. These measures reflect cleanup progress at portions of sites and provide Agency managers with valuable programmatic information. These measures have never had targets, and are not expected to have targets at this time.

The Superfund Revitalization Performance Measure guidance (November 5, 2004) governing "Acres Ready for Reuse" and "Sites with Land Ready for Reuse" will be updated to include Federal facilities and to address the new Sitewide Ready-for-Reuse measure. Today's new Sitewide Ready-for-Reuse guidance supersedes the November 5, 2004 guidance with respect to institutional controls. Therefore, without exception, no "Acres Ready for Reuse," "Sites with Land Ready for Reuse" or "Sitewide Ready-for-Reuse" accomplishments shall be reported where necessary institutional or other controls have not been put in place for that portion of land that is being reported as ready for reuse. This guidance otherwise supplements, but does not change, existing Agency policies and practices for carrying out the investigation and cleanup of sites under CERCLA.

The determination that a site is Sitewide Ready-for-Reuse is based on the information available at the time the determination is made. That determination may revert if site conditions change, or if new or additional information is discovered regarding the contamination at the site. If after a site has been designated as Sitewide Ready-for-Reuse, EPA becomes aware that any of the Ready-for-Reuse requirements are no longer met, then the site will cease to be designated as Sitewide Ready-for-Reuse only when the requirements outlined in this guidance are met.

If at the time of determination or at any other time, EPA becomes aware of other environmental problems that pose unacceptable risk relevant to site use or reuse, including risks addressed under other cleanup or public health authorities, the site should not be reported under this measure.

It should be noted that there is likely to be a small set of NPL sites that may never be ready for reuse. For example, extremely hazardous site conditions, the pervasiveness of contamination, and even the size of larger sites may preclude a site from achieving the Sitewide Ready-for-Reuse designation. Additionally, there are also those NPL sites in which institutional controls specifically state that no future uses are advisable.

#### VI. Disclaimer

This guidance is not a regulation itself, nor does it change or substitute for any regulations. Thus, it does not impose legally binding requirements on EPA, States, or the regulated community. This guidance does not confer legal rights or impose legal obligations upon any member of the public. The determination that a site is Sitewide Ready-for-Reuse does not provide any legal rights or legally enforceable commitments regarding EPA's enforcement intentions or any party's potential liability at the site and does not preclude EPA from taking any necessary enforcement action at the site. Although this guidance does not confer legal rights or impose legal obligations upon any member of the public, interested parties are free to raise questions and objections about the substance of this guidance and the appropriateness of the application of this guidance to particular situations.

## Superfund Property Reuse Evaluation Checklist for Reporting the Sitewide Ready-for-Reuse GPRA Measure

**S**EPA

#### **United States**

## **ENVIRONMENTAL PROTECTION AGENCY**

Washington, DC 20460

# SUPERFUND PROPERTY REUSE EVALUATION CHECKLIST FOR REPORTING

THE SITE	WIDE READY-FO	R-REUSE GPR	A MEASURE			
Office of Superfund Remediation & Technology Innovation and Federal Facilities Restoration & Reuse Office						
PART A – GENERAL SITE INFORMATION						
1. Site Name		2. EPA ID				
3. Site ID		4. RPM				
5. Street Address						
6. City	7. State		8. Zip Code			
<ul> <li>9. Site Wide Ready-for-Reuse Determination Requirements (all must be met for the entire construction complete site)</li> <li>All cleanup goals in the Record(s) of Decision or other remedy decision document(s) have been achieved for any media that may affect current and reasonably anticipated future land uses, so that there are no unacceptable risks.</li> <li>All institutional or other controls required in the Record(s) of Decision or other remedy decision document(s) have been put in place.</li> </ul>						
PART B – SIGNATURE (Branch Chief or above should sign)  NOTE: The outcome of this Property Reuse Evaluation does not have any legally binding effect and does not expressly or implicitly create, expand, or limit any legal rights, obligations, responsibilities, expectations, or benefits of any party. EPA assumes no responsibility for reuse activities and/or any potential harm that might result from reuse activities. EPA retains any and all rights and authorities it has, including but not limited to legal, equitable, or administrative rights. EPA specifically retains any and all rights and authorities it has to conduct, direct, oversee, and/or require environmental response actions in connection with the site, including but not limited to instances when new or additional information has been discovered regarding the contamination or conditions at the site that indicates that the response and/or the conditions at the site are no longer protective of human health or the environment.						
10. Name		11. Title/Organization				
12. Signature		13. Date				
EDA E 0100 4 (0.2004)		•				

EPA Form 9100-4 (9-2004)

## South End Gives Back

A Washington non-profit corporation

Brad Nicholson, President

2302 N.E. 28<sup>th</sup> Street Renton, Washington 98056 <u>brad827@hotmail.com</u> (425)445-0658

February 9, 2011

Vanessa Dolbee – Project Proponent 1055 South Grady Way Sixth Floor Renton, Washington 98055 RECEIVED

FEB 0 9 2011

BUILDING DIVISION

RE: Comment DEIS Quendall Terminals LUA-09-151

Thank you for the opportunity for comment on this very important proposal in Renton. These comments are being submitted on behalf of South End Gives Back (SEGB) and Brad Nicholson. As you already know, SEGB is a Washington 501(c)(3) corporation that was established to advance our members interest in the environment, land use action, and governmental fiscal integrity. Recently, our Board of directors adopted a resolution giving the organization a special focus in the Kennydale area of Renton. We have understood that around 20 million dollars of our tax money will be used to assist the developers at Quendall Terminals. The DEIS under review describes the proposal that takes place on the superfund site as having 3 potential alternatives, covering the site with 20 acres of new impervious surface. The first alternative contains 900 residential units, over 100 feet high, 2176 parking stalls, 21,600 square feet of retail, 9000 square feet of restaurant space, and 245,000 square feet of office space. The second alternative is substantially the same only with slightly fewer residential and no office space. The third is to take no action on the proposal at all. It seems as though the DEIS is saying that if they do not build alternative 1 or 2, then they will take absolutely no action. No consideration is being given to any other development concepts, a situation that SEGB and Brad Nicholson consider to be unreasonable. Realistically, there are any number of ways that the DEIS could mitigate the significance of the proposal, but the development that eventually occurs on the site will be limited to the alternatives as described in the DEIS. SEGB and Brad Nicholson do not consider any of the alternatives to be reasonable.

#### Comment:

As you are aware, the potential development is a "major action significantly affecting the quality of the environment", requiring a final EIS and identification of reasonable alternatives that place decision makers in the position of making an informed choice between those alternatives. I have received comments from neighbors that are very similar to my own and SEGB that the proposal is way too ominous for the community and that it does not implement the City's vision that is outlined in our comprehensive plan. Reasonable development proposals would incorporate measures to comply with codes and laws, mitigate impacts, and effectuate that vision.

The appropriate way to proceed from here would be to fully disclose adverse impacts, set forth alternatives that consider those impacts and set forth and describe reasonable opposing views. Of course, that would mean the creation of alternatives or measures that may not be exactly what the proponent envisions. In any event, it is the position of SEGB and Brad Nicholson that attention to enough detail to achieve compliance is not only needed to mitigate adverse environmental impacts and realize the City's vision, but it is necessary to present sufficient information to facilitate intelligent debate between Citizen's and developer objectives so that decision makers will be capable of an informed and reasoning choice between them:

Requirements for water dependant use, conservation of ecological functions and values, water quality and temperature, vegetation conservation, aesthetics and views, remediated site configuration, critical areas and buffers, complete plans including storm water drainage and BAS, wetlands protection, habitat management, public participation, combined with the obvious desire for job creation and community objections to traffic and parks and recreation impacts, be properly incorporated into the final EIS in a systematic, reasonable manner for the benefit of present and future generations.

To summarize, at some point there will need to be a decision that decides what is reasonable and what is not reasonable, and it should not be limited to only the alternatives that have been proposed. More disclosure is needed.

Thank you in advance for your thoughtful consideration of our comments.

Dated February 9, 2011

**Brad Nicholson** 

Mil Haun



# Curbing Polluted Stormwater and Creating Communities The Case for Low-Impact Development

Lisa Stiffler March 2011

A woman drowns when the basement of her Seattle home suddenly fills with a torrent of filthy water. An overflow of 15 million gallons of sewage and polluted runoff fouls the shoreline of picturesque Port Angeles, putting the waterfront off limits to the residents and visitors of the Olympic Peninsula town due to health concerns. Portlanders are socked with some of the nation's highest water utility rates in order to pay for the city's \$1.4 billion "Big Pipe" projects. Northwest scientists document coho salmon dying in urban streams with their bellies full of eggs, perishing before they can spawn.

The culprit in each of these stories is the most mundane of villains: the rain. The rain is not solely to blame, of course. As the rainwater streams off our roofs and across the built environment—over roadways and landscaped yards—it mixes a massive toxic cocktail. It scoops up oil, grease, antifreeze, and heavy metals from cars; pesticides that poison aquatic insects and fish; fertilizers that stoke algal blooms; and bacteria from pet and farm-animal waste. A heavy rainfall delivers this potent shot of pollutants straight into our local streams, lakes, and bays—threatening everything from tiny herring to the region's beloved orcas to our families' health.

Stormwater runoff doesn't match the traditional image of pollution. There are no factory smokestacks belching waste, no pipes with a steady trickle of noxious industrial effluent. But despite appearances, stormwater packs a wallop. Polluted runoff long ago surpassed industry as the number one source for petroleum and other toxic chemicals that end up in the Northwest's water bodies. Each year, the Puget Sound is sullied by 14 million pounds of toxic chemicals and oil and grease—and that's a conservative estimate. The amount of petroleum waste is so vast, it's as if more than 70,000 cars pulled up to the beach and emptied their tanks straight into the Sound each year.

Polluted runoff threatens to make water from Lake Whatcom—the sole source of drinking water for the city of Bellingham—undrinkable, and has helped put shellfish harvesting off limits for Washington state beachgoers from north of Everett to south of Tacoma. Some residents of BC's Salt Spring Island had to temporarily switch to bottled water this winter when toxic algae contaminated their water supply. Where

2

did the nasty plants come from? The algal bloom was triggered as "a result of excess phosphorous ... from surrounding properties," according to news reports.8

How has the Northwest's iconic rain been transformed into such a menace? A century of building pipes, gutters, and impervious surfaces is to blame—along with pollution from cars, lawns, farming, and more. Our primary goal has long been simply

to shunt water away from buildings and pavement as quickly as possible to save our basements from flooding and to prevent erosion. But we haven't historically given much thought to where runoff goes. The way things are built now, when the rain hits hard surfaces, it grabs dirt and pollutants and flushes them into drains that often lead directly into sensitive local waterways without any kind of treatment.

Stormwater is so polluted with petroleum, it's as if 70,000 cars emptied their tanks straight into Puget Sound each year.

In some cases, the runoff merges with sewer waste, resulting in overflows of raw sewage during heavy storms. Over the past three years, sewage-tainted runoff has forced the closure of 32 Washington beaches, some for a couple of days, others for weeks. Stormwater runoff mixed with sewage can carry salmonella bacteria, parasitic giardia, and Norwalk-like viruses. Ailments caused by exposure to sewage-tinged water include: diarrhea, vomiting, stomach cramps, fever, hepatitis, bronchitis, pneumonia, and swimmer's itch. <sup>10</sup>

But there's a solution for Cascadia's flood waves of runoff. It's an affordable fix that curbs the damage to our waterways while making our neighborhoods and communities more walkable, sustainable, and inviting. It's called low-impact development, or LID. The approach uses a suite of conservation and engineering tools to make developed areas behave more like natural ecosystems. Low-impact development is starting to catch on across the Northwest, but before exploring these green-building strategies, let's dig a little deeper into the challenges posed by polluted runoff.

#### Rivers of costly runoff

Ten bathtubs full of water. That's how much rain pours off one average-size house during a good-sized drenching. In a typical year in Portland or Seattle, approximately 26,600 gallons of runoff rushes through the gutters of that single home. And there are more than 2.8 million houses in Oregon and Washington, as well as countless more apartments, condos, warehouses, offices, stores, and other buildings.

When the rain runs off that home's roof—and its driveway, sidewalk, and lawn—it flows into a labyrinth of stormwater infrastructure. Even relatively arid cities such as Spokane must maintain more than 300 miles of stormwater sewers. Traditional approaches to handling polluted stormwater have been costly to governments as well as to home and business owners. Cities and counties in Washington spend more than a quarter billion dollars a year trying to control and clean contaminated runoff. 14

Victoria and Vancouver in British Columbia, Spokane, and Coquille near the Oregon Coast are among the Northwest cities and towns facing expensive upgrades to stop overflows of sewage and polluted runoff that are triggered after a downpour.

For nearly two decades, Portland has been working on its "Big Pipe" projects to stop billions of gallons of raw sewage and stormwater from fouling the Columbia Slough

and Willamette River. The \$1.4 billion projects should be completed this year. The seaside town of Port Angeles is trying to finalize plans for a project that will cost at least \$40 million to control its storm sewer waste. Last year, the city's combined sewer system spewed nearly 24 million gallons of sewage-contaminated stormwater into Port Angeles Harbor. The season of the sewage contaminated stormwater into Port Angeles Harbor.

And there are the untold millions spent repairing stormwater-related damage from flooding, landslides, and sinkholes. Over the course of one particularly wet weekend this past December, Seattle Public Utilities reported more than 700 calls about flooding and sent crews to 332

Sewage-tinged runoff can cause diarrhea, vomiting, stomach cramps, fever, hepatitis, bronchitis, pneumonia, and swimmers itch.

locations. The city has paid millions of dollars to settle flood claims over the past decade, spending more than \$6 million for the damage caused in the December 2006 storm that drowned a woman.<sup>18</sup>

#### Putting a LID on polluted stormwater

A stroll down a stretch of 2nd Avenue Northwest in Seattle is almost a walk in the park. The slightly meandering residential street is lined with wide strips of native grasses, small shrubs, and trees. Along the shoulder, interspersed among parking spots, are swales—or gentle depressions—that fill with water during a downpour. On this street, you won't find sludgy gutters brimming with muddy water and trash, or deserts of black asphalt that foster shoe-soaking puddles.

The street was one of the Northwest's first experiments in natural drainage systems, or low-impact development. A decade ago, workers jackhammered up the block and rebuilt it to catch and clean runoff the way it's done in nature. In a forest, rainwater falls on branches and leaves and slowly evaporates, or it soaks into the ground and gets sucked up by plants. The soil and organisms living in the soil help clean and filter the polluted stormwater. The Seattle project—called SEA Street—has been wildly successful, nearly eliminating runoff, even during heavy rains. <sup>19</sup> The slightly narrowed street is safer for kids and pedestrians, and creates natural park-like spaces that are inviting to wildlife and people.

"LID systems really do have the ability to filter water naturally and create much nicer, softer, greener stormwater facilities that really engage the public a lot more," said Tim Bailey, a geotechnical engineer and experienced practitioner of low-impact development with GeoEngineers, Inc., in Seattle.<sup>20</sup>

The philosophy of low-impact development is to try to replicate nature's way of managing rainfall. It means taking surfaces that normally repel water—roofs and pavement—and making them spongy.

Low-impact development can mean building green roofs covered in water-trapping soil and plants. It can mean hooking downspouts to rain barrels or cisterns to store

the water that does run off, or having downspouts flow into "rain gardens" featuring swales. It can mean building driveways from a lattice of pavers that leave some of the soil exposed, or using permeable concrete that lets water pass through to the soil below. It also means protecting, preserving, and restoring native vegetation.

"There is no reason not to make every single residentialscale property do something (to reduce stormwater pollution)," said Peg Staeheli, a principal with Seattle's SvR Design Co., a local leader in low-impact development. "There are a lot of tools out there now that can be used."<sup>21</sup> The philosophy of lowimpact development: replicate nature's way of managing rainfall by making water-repellent surfaces spongy.

#### Shifting from gray to green

Seattle is far from alone in realizing that there are alternatives to traditional gutter-and-storm-drain systems—also called "gray" infrastructure—that cost too much and don't work well. In recent years, low-impact development projects have cropped up as smart investments across the region. Here are some noteworthy examples:

Bremerton: A blue-collar city on the shores of Puget Sound, Bremerton is being permeated with green stormwater infrastructure. A new 1,600-foot-long bridge and an industrial roadway project will both use low-impact development to treat much of its stormwater runoff. In each case, state and local partners pushed for conventional stormwater treatment for the projects, but Bremerton officials successfully made the case for using low-impact development because it was cheaper.<sup>22</sup>

Portland: The City of Roses has so many natural drainages that it has published a walking tour for visitors interested in viewing its attractive rain gardens and swales.<sup>23</sup> Portland has grown its green infrastructure in part through policy incentives. It pays residents to unhook their home downspouts from the city's storm sewer system and redirect the water into rain gardens, and its green roof program offers rebates to residents and businesses installing ecoroofs. There are at least 350 ecoroofs in Portland, topping condos, the central library, government offices, and a university building, covering about 26 acres in all.<sup>24</sup>

**Puyallup:** The once fertile farm town and now suburb of Tacoma has embraced the use of swales and porous asphalt. Puyallup has helped its residents build 20 rain gardens in three different neighborhoods. The installations were done simultaneously within a neighborhood and city officials organized mini environmental fairs celebrating the events, which included guests such as gardening guru Ciscoe Morris.

"I've been seeing neighborhoods coalesce (around the projects)," said Mark Palmer, a stormwater engineer for the city and lead on the effort. "They become a close knit little community." <sup>25</sup>

Lacey: One of the first cities in the state to approve regulations back in 1999 to encourage low-impact development, Lacey has continued pursuing green stormwater solutions. The city requires a developer to use low-impact development to soak up all the rain that falls on a site rather than pipe it into a storm sewer system, provided the

ground is sufficiently absorbent.<sup>26</sup> Lacey's Regional Athletic Complex completed in 2009 features pervious concrete to reduce runoff.<sup>27</sup>

Lacey also has strict tree-protection provisions that call on developers to protect or replant trees, and homeowners must get permission to fell even sick and hazardous trees.<sup>28</sup>

Victoria: There are a number of high profile green roof projects in British Columbia (Vancouver's Convention Center and Olympic Village to name two), but the province has surprisingly fewer examples of rain gardens and swales. One exception is Victoria's Trent Street rain gardens. The 2009 pilot project includes two roadside rain gardens that help soak up street runoff that would otherwise pollute nearby Bowker Creek.<sup>29</sup>

**Pringle Creek Community:** Called "the nation's first full-scale porous pavement project" by the Asphalt Pavement Association of Oregon, the 32-acre sustainable community near Salem boasts 7,000 feet of porous asphalt roadways and 2,000 feet of porous alleys.<sup>30</sup> Pringle Creek also features swales and narrower roads to create fewer hard surfaces. And it's a leader in tree conservation: 80 percent of the development's trees were protected and one-third of the community is green or open space.

Spokane: In 2007, Washington State University Spokane County Extension and Spokane County Stormwater Utility planted a dozen swales in front yards around the city in order to test which plants worked best in that climate, to monitor for pollutants, and to raise awareness about rain gardens.<sup>31</sup>

A recent study shows that many of the swales are performing better over time.<sup>32</sup>

Low-impact treats large of water, is maintain.

In these examples and others, low-impact development has been shown to be less expensive and more effective at cleaning stormwater than the traditional gutter-and-storm-drain systems. A study by the US Environmental Protection Agency compared the cost of stormwater clean-up projects that were built using low-impact development techniques to what they would have cost using conventional strategies. In 11 of 12 cases examined across North America, the green option was cheaper than gray by anywhere from 15 to 80 percent.<sup>33</sup>

A study by ECONorthwest, an economic consulting firm, also found that low-impact development costs less for both residential and commercial projects in Cascadia and beyond. The researchers concluded that low-impact development would fare even better in comparisons that considered more than just construction costs. In many instances, low-impact development treats larger volumes of water than traditional approaches, is cheaper to maintain, boosts property values, creates wildlife habitat, and reduces air pollution and greenhouse gases by planting and protecting trees and other vegetation.<sup>34</sup>

Low-impact development treats larger volumes of water, is cheaper to maintain, boosts property values, creates wildlife habitat, and reduces greenhouse gases.

#### Death by a thousand rainstorms

Ailing Northwest rivers and lakes face death not so much by a thousand cuts as by a thousand rainstorms, each flushing filthy runoff into our region's environmentally and economically important waterways.

While low-impact development is gaining popularity, it's far from being standard practice. Developers, planners, and government agencies often are more comfortable sticking with the conventional systems that they know. In many cases, regulations require traditional infrastructure, whether mandating wider roads to accommodate parking and emergency vehicles, or prescribing stormwater pipes when a swale would work better and cost less.

But work is underway to change this. In recent years, the Puget Sound Partnership helped 36 Washington municipalities upgrade their codes to encourage the use of green infrastructure.<sup>35</sup> Now the Partnership is writing a local-code guidebook for governments that want to incorporate low-impact development requirements into their codes and regulations. It should be done in July.<sup>36</sup>

There are stormwater training programs for landscapers and other contractors as well as city and county planners and permit writers. Local universities, utilities, and nonprofit organizations are teaming up to offer seminars and workshops.<sup>37</sup> It's important to improve the level of expertise of those doing low-impact development. Because while green infrastructure offers a great fix for polluted stormwater, trained practitioners are needed—particularly for large projects.

"LID is something you have to look at with the willingness to be flexible and use the most appropriate systems for a given site," Bailey said. "It takes a lot more creativity.

"For small scale (projects) you can come up with something that works most of the time, most of the places."38

Seattle recently had a painful reminder that green solutions still require careful planning. A rain garden pilot project in the Ballard neighborhood hasn't worked as expected, resulting in swales that fill with water and don't drain well. The city has formed a task force to solve the problem.<sup>39</sup>

There are additional opportunities for making green stormwater solutions more widespread. In 2010, Washington legislators pledged \$50 million for stormwater improvements. 40 This year, a coalition of Washington's city and county leaders, labor representatives, and environmental advocates are asking the Legislature to establish a long-term funding source to pay for more low-impact development. The Clean Water Jobs Act would put a 1 percent fee on petroleum products, pesticides, herbicides, and fertilizers. 41 Oregon lawmakers are considering a ban on copper in vehicle brake pads in an effort to remove one of the prime sources of a pollutant that's harmful to fish and other aquatic life. 42 Washington approved a similar measure last year, becoming the first state to do so.

There is an urgency to act. The Washington Department of Ecology is working on rules that will require more use of low-impact development, and final regulations should be completed by summer 2012.<sup>43</sup> The US Environmental Protection Agency is strengthening national stormwater regulations that should take effect in less than two

years and will encompass more towns and cities than ever before.<sup>44</sup> And the runoff problem is likely to worsen if the population of Washington, Oregon, and Idaho swells to an expected 14.5 million residents by 2030, a roughly 20 percent increase from today.<sup>45</sup>

"Time is not on our side," said Tom Holz, a stormwater and low-impact development expert from Olympia. "We may lose the battle just simply through dallying."

#### **About the Author**

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**Sightline Institute** is a not-for-profit research and communication center—a think tank—based in Seattle. Sightline's mission is to make the Northwest a global model of sustainability—strong communities, a green economy, and a healthy environment.

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- 45. Office of Financial Management, "Forecast of the State Population: November 2010 Forecast," <a href="http://www.ofm.wa.gov/pop/stfc/stfc2010.pdf">http://www.ofm.wa.gov/pop/stfc/stfc2010.pdf</a>.

Photo Credit: Photo of bioswale © Thomas Le Ngo, used under a creative commons license.

#### OSWER 9365.0-30

#### **MEMORANDUM**

SUBJECT: Reuse Considerations During CERCLA Response Actions

FROM: Michael B. Cook, Director

Office of Emergency and Remedial Response

TO: Superfund National Program Managers Regions 1-10

OERR Center Directors and Process Managers

#### Purpose:

With this memorandum I want to emphasize again to managers, both at Headquarters and in the Regions, the importance of early and continuing consideration of anticipated future use during Superfund remedial and removal site activities. Assistant Administrator Marianne Lamont Horinko places a high priority on making land revitalization an integral part of our cleanup programs. What we have learned over the past few years is that we can select and implement remedies that are protective, while also accommodating appropriate reuse of the land once the remedy is complete. In our daily operations both at Headquarters and in the Regions, we should reflect this awareness that cleanup and reuse are mutually supporting goals and we must make positioning a site for reuse a normal part of the way we do business.

#### Background:

Superfund policies over the past decade have increasingly addressed land reuse issues. The "Land Use Directive in the CERCLA Remedy Selection Process" (OSWER Directive No. 9355.7-04, May 1995) explains how to consider land use when making remedy selection decisions. In July 1999, EPA launched its Superfund Redevelopment Initiative, a coordinated national effort to develop policies, procedures and practices to integrate reuse into the Superfund assessment and cleanup process. On June 4, 2001, The Agency issued a Directive (OSWER 9355.7-06P) to give Regional managers a tool for making reuse assessments to implement the Land Use Directive. Other Agency guidance and policy has also incorporated reuse-oriented elements (e.g. EPA's policy for conducting partial deletions at NPL sites). To help Superfund explore practical implementation of these ideas, EPA has announced the selection of pilot sites where communities receive financing and services that help them assess future uses of Superfund sites; this reuse planning is helping us to shape remedies.

#### OSWER 9365.0-30

#### Implementation:

As Superfund's land revitalization initiatives have matured, we in OERR are at a stage at which we can expect reuse considerations to be fully integrated into operations. This full integration means consideration of reuse throughout the response cycle, from investigation and listing through close-out and deletion and long-term stewardship. Over the next several months, I have asked John Harris, the National Program Coordinator for Superfund Redevelopment, to work with staff in all aspects of cleanup to ensure that we all gain a more detailed understanding of how this reuse consideration should work. OERR is preparing a Directive, to be circulated in draft for comment in the coming weeks, that will present in considerable detail procedures for achieving our goals in this area. If you have questions or concerns about how integration of reuse affects your activities, please contact John at (703) 603-9075.

We will also develop and incorporate into our program new measures of our effectiveness in reaching Superfund's revitalization goals. Earlier this month Regions were asked to participate in developing these performance measures that will help us establish performance baselines and assess our progress.

Finally, as we meet the challenge of integrating land use expectations into site cleanup decisions, and as we learn how to effectively measure our success, we will look for opportunities to offer our experience to other federal and State remediation programs through the Agency's One Cleanup Program initiative.

#### Action:

I urge you to give your full attention to the consideration of reuse at sites and to the forthcoming Directive on Reuse Considerations During CERCLA Response Actions. Please make sure that your staffs are fully aware of the priority of the Agency's revitalization agenda that underlies this effort. I also invite your support in developing the new GPRA measures announced in my memorandum of September 6, 2002.

benzene and naphthalene, the sediment porewater samples were also analyzed for several relatively non-reactive "tracer" cations (sodium, potassium, calcium, and magnesium) to help differentiate between chemical/biological concentration attenuation processes that affect Site COIs and simple dilution with surface water. The results of the evaluation of these data showed significant attenuation (more than two to three orders of magnitude) of benzene and naphthalene as compared to the tracer cations, indicating the existence of biodegradation and/or chemical attenuation processes in the transition zone between groundwater and Lake Washington.

It is important to note that conclusions regarding degradation at the Site are applicable to existing conditions and processes. To the extent that future fate and transport characteristics of the Site are altered from existing conditions (e.g., following the implementation of remedial actions), these may lead to changes in fate and transport mechanisms and/or rates. Evaluation of future attenuation characteristics is included in the detailed evaluation of alternatives in the FS.

#### ES.7 Baseline Risk Assessment

Baseline human health and ecological risk assessments were conducted in accordance with EPA guidance using data of sufficient quality that have been collected from the Site.

The baseline human health risk assessment evaluated the following exposure scenarios:

- Future Residential Exposure Scenario. The residential scenario was based on
  potential redevelopment of the Site for residential purposes and future Site use by
  adults and children. The potential routes of exposure to contaminants in soil (to a
  depth of 15 feet bgs) and groundwater include incidental ingestion, dermal
  contact, and inhalation of fugitive dusts and vapors. Inhalation of vapors
  migrating from groundwater into future residential buildings is also possible.
- Future Occupational Worker Exposure Scenario. Adult workers could potentially
  be exposed to chemicals in soil (from 0 to 15 feet bgs) by incidental ingestion,
  dermal contact, and inhalation of ambient dust and vapors. Vapor intrusion into
  future non-residential buildings and exposure to groundwater by occupational

- workers are also possible; however, these pathways are addressed under the more health-conservative residential exposure scenario.
- Future Construction/Excavation Worker Exposure Scenario. Adult construction/
  excavation workers could potentially be exposed to chemicals in soil (from 0 to 15
  feet bgs) by incidental soil ingestion, dermal contact with soil, and inhalation of
  ambient dusts and vapors generated during excavation activities. Potential routes
  of exposure to shallow groundwater for the construction/ excavation worker
  include dermal contact and inhalation of ambient vapors generated during
  excavation activities.
- Current and Future Recreational Beach User Exposure Scenario. The recreational
  beach user scenario addresses individuals engaged in recreation at the shoreline,
  gaining access either from Site uplands or via boat. Potential routes of exposure to
  nearshore surface sediment (0 to 4 inches bgs) and surface water include
  incidental ingestion and dermal contact.
- Current and Future Recreational Fishing Exposure Scenario. The recreational fishing exposure scenario addresses adult recreational anglers gaining Site access by boat or land and harvesting fish or shellfish for personal consumption using hook and line, traps, digging, or other methods. Potential exposure routes include ingestion of contaminants that bioaccumulate in fish/shellfish tissue, and incidental ingestion of and dermal contact with sediment during angling activities.
- Current and Future Subsistence Fishing Exposure Scenario. Lake Washington is a
  U&A fishing ground for the Muckleshoot, Suquamish, and Tulalip Tribes.
  Potential exposure routes under this scenario include ingestion of contaminants
  that bioaccumulate in fish/shellfish tissue, and incidental ingestion of and dermal
  contact with sediment during angling activities.

Figure ES-9 shows a generalized CSM illustrating exposure pathways relevant to human receptors at the Site.

EPA default exposure assumptions were used to evaluate these scenarios, including the subsistence fishing scenario. As discussed in the Human Health and Ecological Risk Assessment (HERA) Work Plan (Anchor QEA and Aspect 2009b), if no risk is indicated from subsistence fishing using this default ingestion rate, regional Tribal consumption rates (which

may be greater than the default subsistence rates) may need to be evaluated to see that Tribal and subsistence anglers are adequately protected.

The baseline human health risk assessment evaluated potential noncancer and cancer effects. For noncancer effects, the likelihood that a receptor will develop an adverse effect is estimated by comparing the predicted level of exposure for a particular chemical with the highest level of exposure that is considered protective. The ratio is termed the hazard quotient (HQ). When the HQ for a chemical exceeds 1, there is a concern that noncancer health effects are possible. To assess the potential for noncancer effects posed by exposure to multiple chemicals, a hazard index (HI) approach is used in accordance with EPA guidance (1989).

The potential for cancer effects is evaluated by estimating excess lifetime cancer risk (ELCR). This risk is the incremental increase in the probability of developing cancer during one's lifetime in addition to the background probability of developing cancer (i.e., if no exposure to Site chemicals occurs).<sup>5</sup> In interpreting estimates of excess lifetime cancer risks, EPA under the Superfund program generally considers action to be warranted when the multichemical aggregate cancer risk for all exposure routes within a specific exposure scenario exceeds 1 x 10<sup>-4</sup>. Action generally is not required for risks between 1 x 10<sup>-6</sup> and 1 x 10<sup>-4</sup>; however, this is judged on a case-by-case basis.

The results of the baseline HHRA are summarized in Table ES-3. As indicated in the table, the results of the human health risk characterization indicate that non-cancer HIs exceed 1 for all but the recreational beach user and recreational fishing scenarios. HIs exceeding 1 range from 3 (subsistence fish ingestion) to 7,995 (groundwater exposure for the future resident). ELCR estimates exceed  $1 \times 10^{-4}$  for all six scenarios using Site data, ranging from  $2 \times 10^{-4}$  (recreational fish ingestion) to greater than  $8 \times 10^{-1}$  (groundwater exposure for the future resident). The residential indoor air pathway is also of concern. The ELCR estimate for this pathway is  $2 \times 10^{-2}$ , with the primary risk contributors being benzene, naphthalene, and ethylbenzene.

 $<sup>^{5}</sup>$  For example, an ELCR of 2 x  $10^{-6}$  means that for every 1 million people exposed to a carcinogen throughout their lifetimes, the average incidence of cancer may increase by two cases of cancer.

For the beach user and fishing scenarios, risk estimates were also developed using sediment samples from background locations in order to understand the contribution of background concentrations to Site risks and provide information that may be used for risk management decisions. When using the background sediment dataset, HIs are less than 1 for all three scenarios, and ELCR estimates for recreational and subsistence fish ingestion exceed  $1 \times 10^{-6}$  but are less than  $1 \times 10^{-4}$ .

Ecological receptors potentially include the animals and plants that use terrestrial and/or aquatic habitats within the Site. These ecological receptors can generally be segregated into plants, invertebrates, reptiles and amphibians, fish and shellfish, and mammals and birds. Representative species from groups including plants, invertebrates, fish, shellfish, birds, and mammals were selected as receptors of concern and further evaluated in a baseline ecological risk assessment to assess if and to what degree they may be at risk from contaminated media at the Site.

Ecological HQs were estimated using multiple lines of evidence; these included comparison of bulk soil (for soil invertebrates and terrestrial plants) and surface water/porewater concentrations (for fish and aquatic plants) to screening levels, and a multi-media exposure model approach that compared estimated total dietary intakes (TDIs) with literature toxicity reference values (TRVs) for both terrestrial and aquatic-dependent wildlife. Benthic invertebrate risk was assessed directly through sediment bioassays and by using the ESBQ approach for PAHs (EPA 2003).

The results of the ecological risk assessment indicate that risks for both terrestrial and aquatic-dependent wildlife receptors exceed an HQ of 1. The primary risk drivers are PAHs in soil, sediment, and sediment porewater. Site sediment that poses a PAH-related risk to benthic macroinvertebrates has been delineated in the Nearshore Groundwater Discharge Area (adjacent to Quendall Pond) and the T-Dock Spill Area. Benthic toxicity measured in sediment bioassays correlates closely with porewater PAH concentrations and is corroborated by PAH ESBQs that exceed 1.

If a cumulative ELCR of 1 x 10<sup>-4</sup> was exceeded for a given medium, the individual constituents that pose an ELCR of 1 x 10<sup>-6</sup> were identified as COCs for human health. Constituents that exceeded an HQ of 1 for either human or ecological receptors were also identified as COCs. Table ES-4 provides a list of the COCs by medium. The primary COCs that pose risks to human health throughout the Site are cPAHs, naphthalene, benzene, and arsenic. The primary COCs that pose risks to ecological receptors throughout the Site are PAHs, represented as both individual chemicals and as totals (LPAHs, HPAHs, total PAHs, and PAH ESBQs).

#### ES.8 Conclusions and Recommendations

A total of 445,000 gallons of creosote and coal tar DNAPL is estimated to be present in the subsurface at the Quendall Site, covering approximately 9.7 acres of the Site (including offshore portions of the Site beneath Lake Washington), and typically observed in the upper 20 feet bgs. Coal tar and creosote product indicator chemicals (i.e., benzene, naphthalene, and cPAHs) and arsenic are present above PRGs in groundwater where DNAPL is present, with impacted groundwater generally extending downgradient (both horizontally and vertically) from DNAPL-impacted areas. The migration of contaminated groundwater from DNAPL source areas represents a secondary source of contamination to soil and sediment; therefore, the horizontal and vertical extent of contamination in groundwater is a good indicator of the extent of impacts to these other media. The results of the baseline human health and ecological risk assessment indicate that risks posed to humans and ecological receptors based on exposure to contaminated Site media exceed EPA's acceptable levels. The primary contributors to unacceptable risk are PAHs, naphthalene, benzene, and arsenic.

#### Based on these findings, it is recommended that:

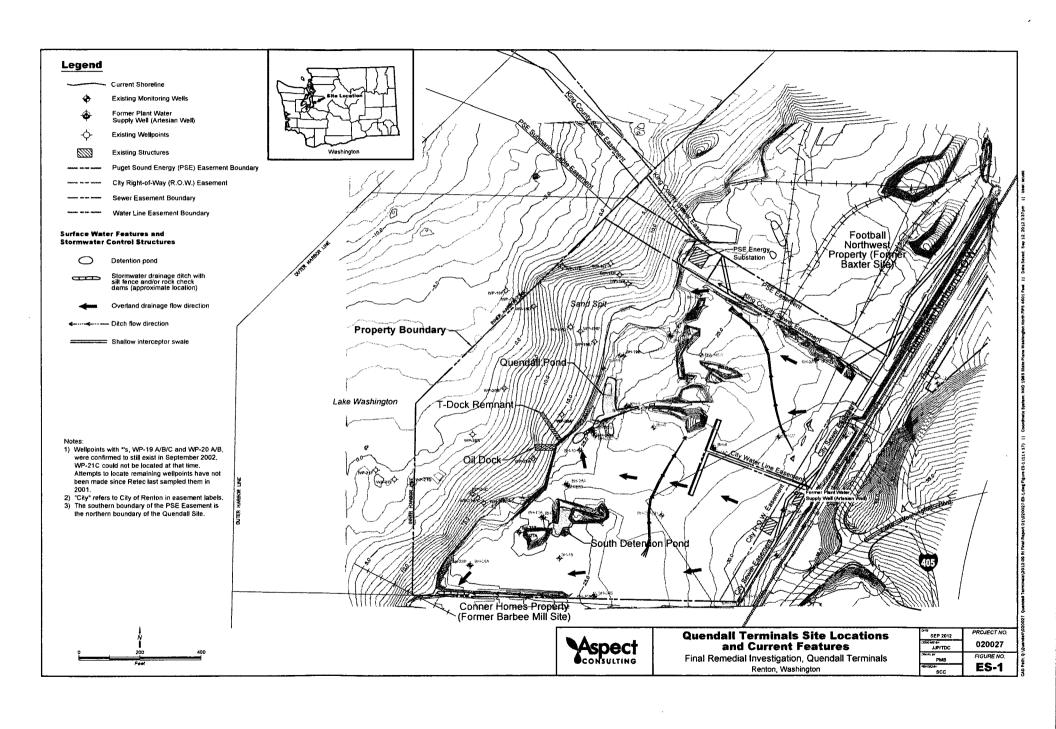
- Identification and evaluation of remedial alternatives that address DNAPL and other affected Site media with contaminants exceeding PRGs should be pursued in the FS.
- Groundwater flow and fate/transport modeling tools should continue to be updated as new groundwater monitoring data become available; the models should be enhanced in anticipation of their value in assessing candidate remedial alternatives developed during the FS.

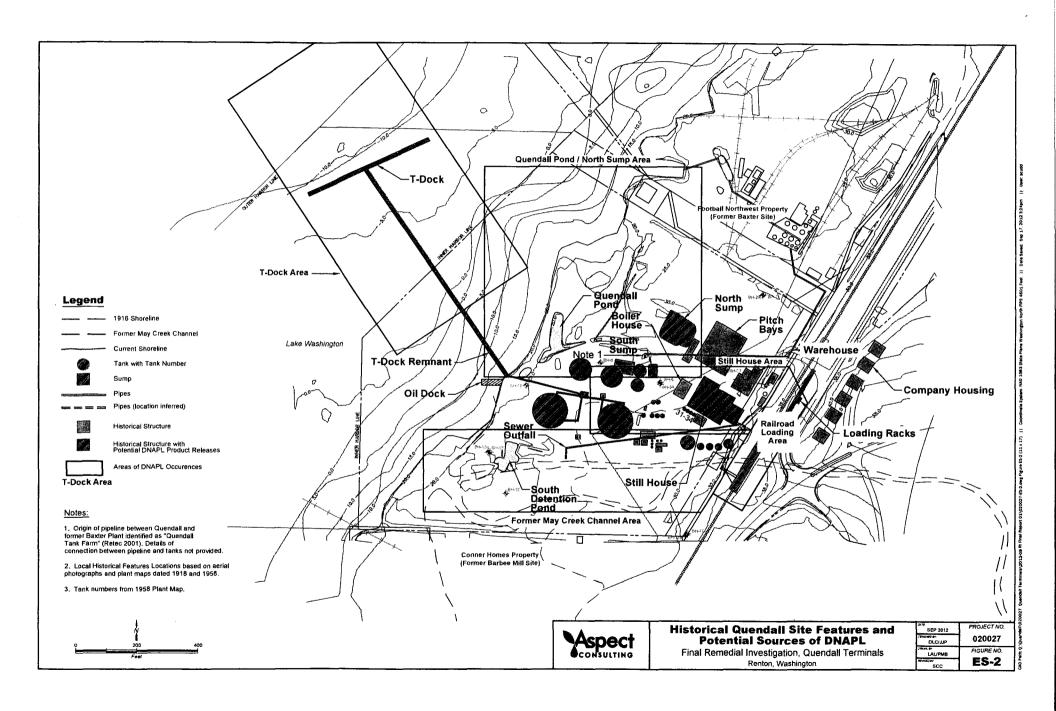
- Groundwater monitoring should continue to support ongoing analysis of groundwater quality trends and the horizontal and vertical migration of DNAPL over time.
- Until the selected remedy is fully functional, public access to the Site should be restricted by use of upland fencing, and signs prohibiting access to lake sediments and collection of shellfish for human consumption.

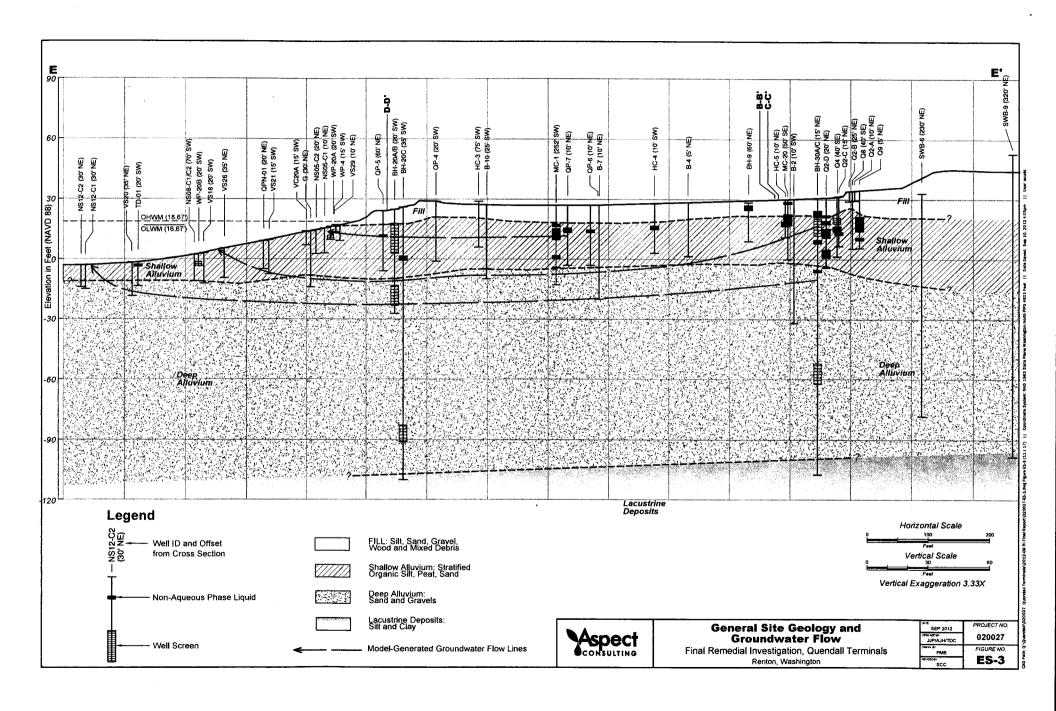
#### **ES.9** References

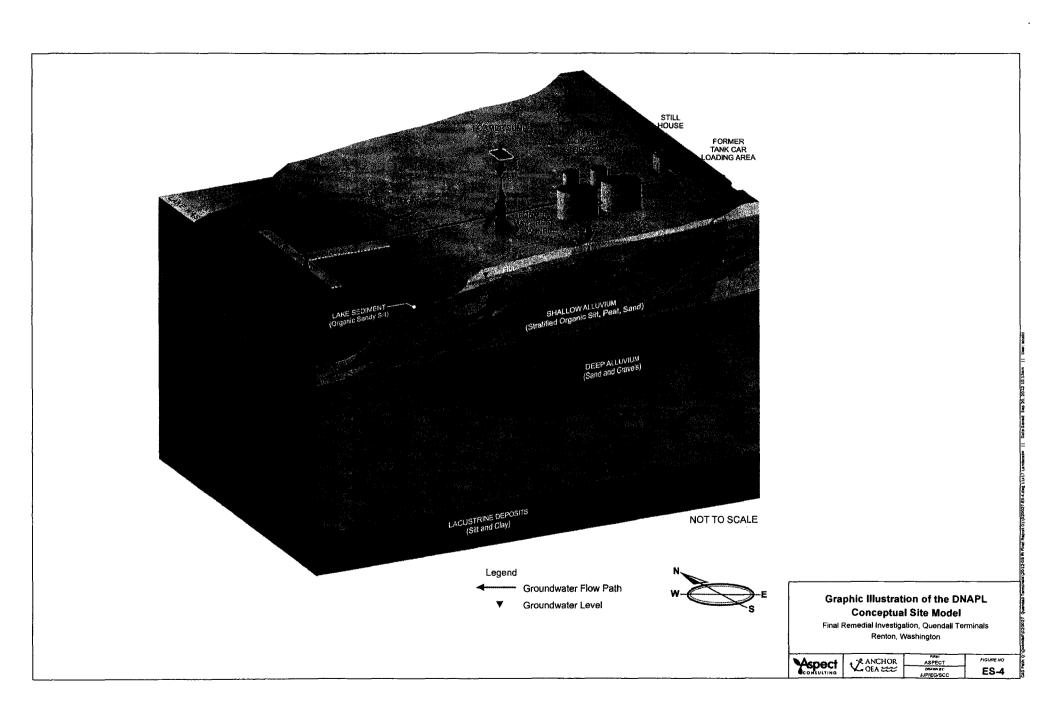
- Anchor and Aspect, 2007. Draft Task 3 Preliminary Conceptual Site Model, Remedial Action Objectives, Remediation Goals, and Data Gaps, Remedial Investigation/Feasibility Study, Quendall Terminals Site (Draft Task 3 Report). Report prepared for U.S. Environmental Protection Agency, Region 10, on behalf of Altino Properties, Inc., and J.H. Baxter & Company by Anchor Environmental, LLC, Seattle, WA and Aspect Consulting, LLC, Seattle, WA. November 2007.
- Anchor QEA and Aspect, 2009a. Final Data Collection Work Plan, Remedial Investigation/Feasibility Study, Quendall Terminals Site, Renton, Washington. Prepared for U.S. Environmental Protection Agency, Region 10, on behalf of Altino Properties, Inc., and J.H. Baxter & Company by Anchor QEA, LLC and Aspect Consulting, LLC. June 2009.
- Anchor QEA and Aspect, 2009b. Final Work Plan, Human Health and Ecological Risk Assessment, Quendall Terminals Site, Renton, Washington (HERA Work Plan).

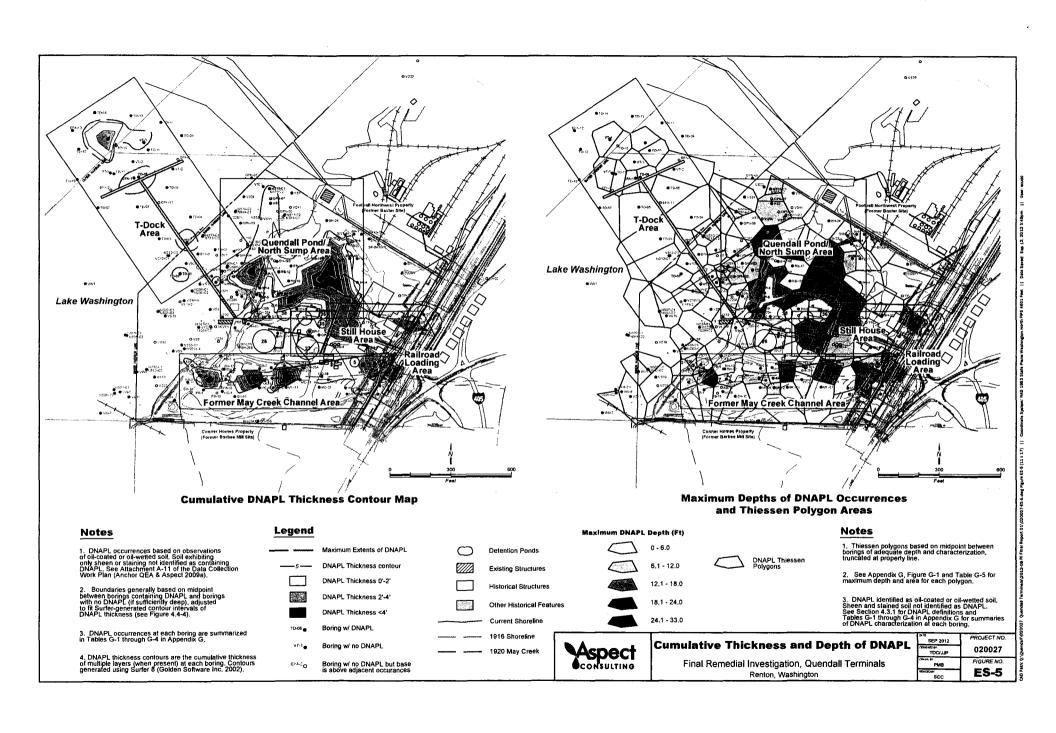
  Prepared for U.S. Environmental Protection Agency, Region 10, on behalf of Altino Properties, Inc., and J. H. Baxter & Co. by Anchor QEA, LLC, and Aspect Consulting, LLC. November 2009.
- EPA (U.S. Environmental Protection Agency), 1989. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A), Interim Final. Office of Emergency and Remedial Response. EPA/540/1-89/002. December.
- EPA (U.S. Environmental Protection Agency), 2003. Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: P AH Mixtures. EPA/600/R-02/013. November 2003.

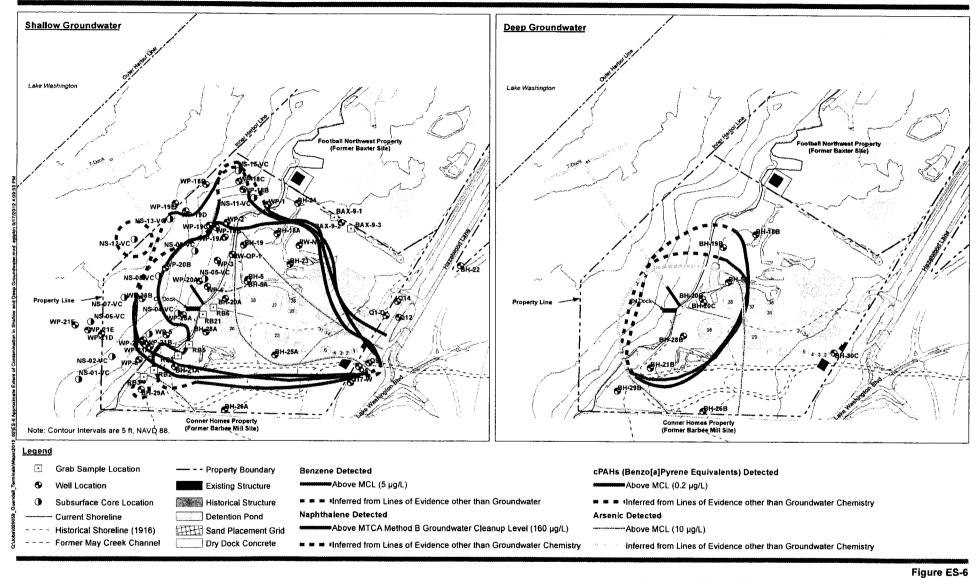








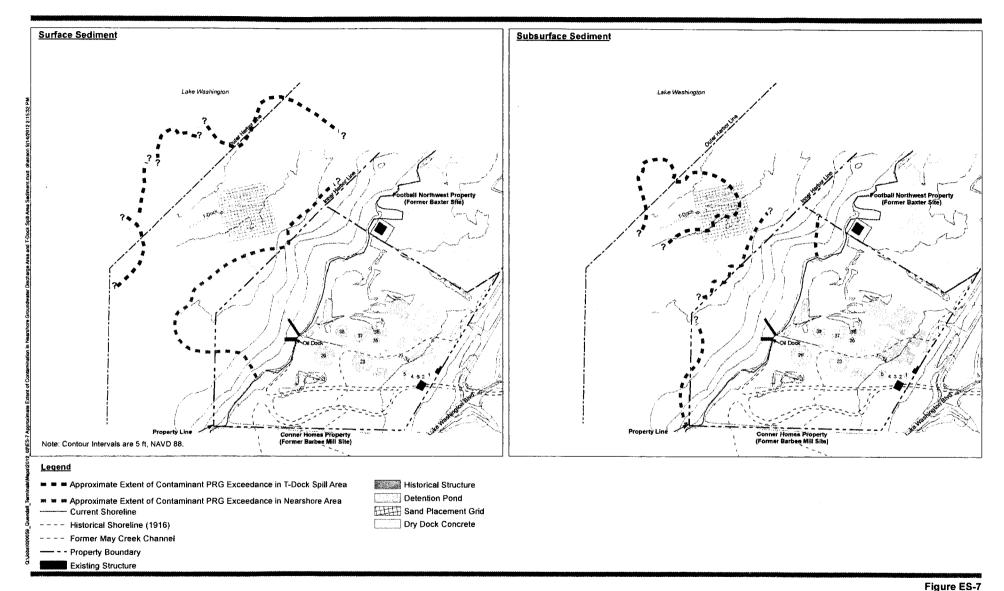




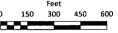




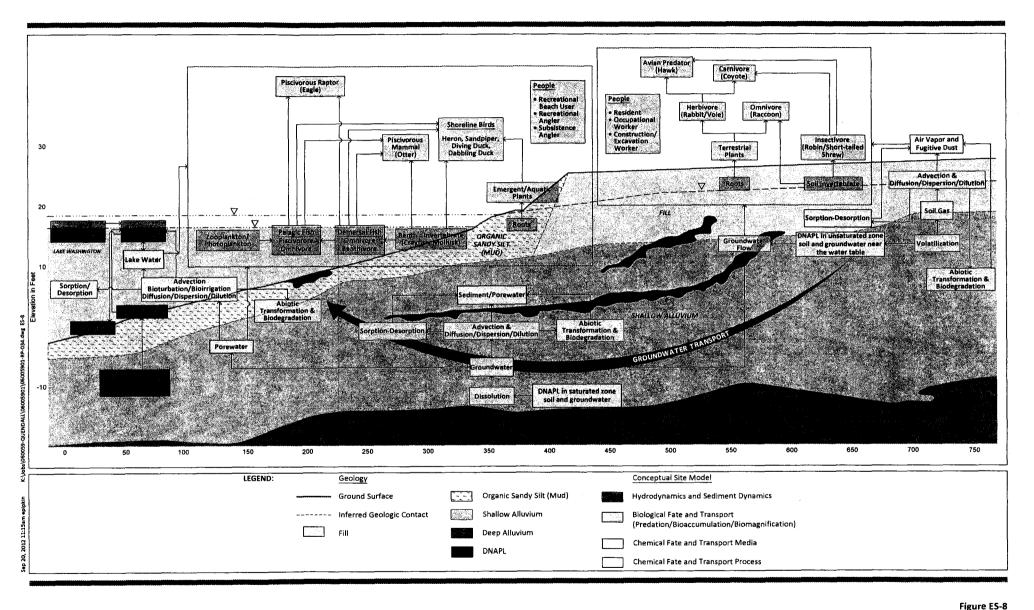














Graphic Illustration of the Contaminant Fate and Transport Conceptual Site Model
Final Remedial Investigation, Quendall Terminals

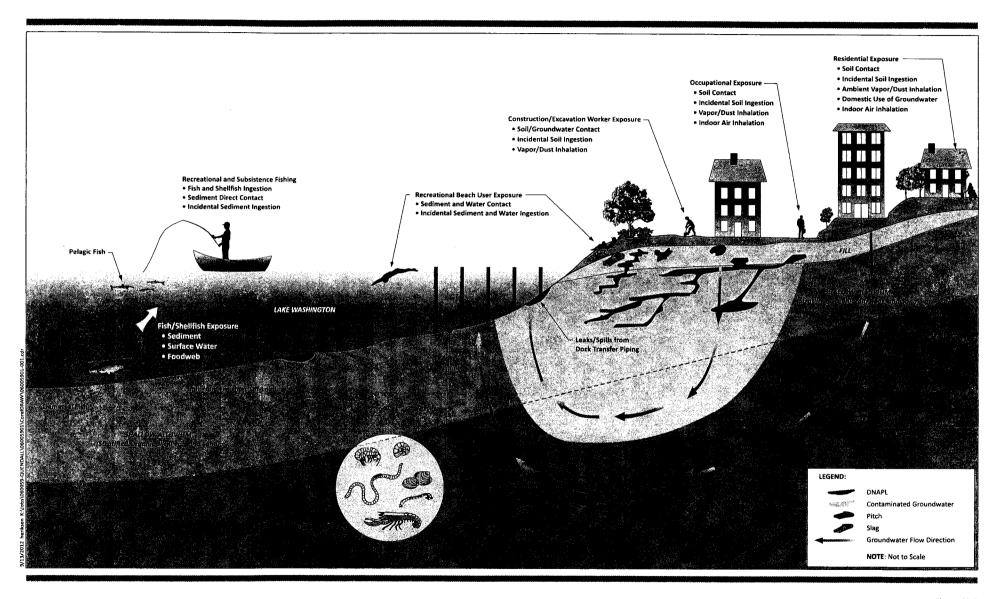




Figure ES-9
of Human Health Conceptual Site Exposure Model

Table ES-1
Site-Specific Contaminants of Interest and Indicator Chemicals

	Environmental Medium at the Quendall Site				
Chemical Metals	Groundwater	Soil	Bulk Sediment	Sediment Porewater/ Surface Water	
Arrand					
Cadmium	To the state of the second state of the second seco	Summer to the Artist College Service College Service S	The State of State and State of State o		
(Chico) for third (II)					
e (Copped)		4 040/35			
Lead					
Nickel					
Iron					
Zinc					
Polynuclear Aromatic Hydrocarbons (PAHs)					
Acenaphthene					
Acenaphthylene	į				
Anthracene					
Benzo(a)anthracene					
Benzo(a)pyrene					
Benzo(b)fluoranthene					
Benzo(k)fluoranthene					
Chrysene					
Dibenz(a,h)anthracene					
Indeno(1,2,3-c,d)pyrene					
Fluoranthene					
Fluorene					
(Nardhlanatone					
Phenanthrene					
Pyrene					
2-Methylnaphthalene					
Mariel e Parie (11 och fram Grenner 77 (CAIPA 2016)) (1 Moriel gereit (Locate vice) Media (Seif Geolderijk)					
Semivolatiles, Miscellaneous			2		
Bis(2-Ethylhexyl)phthalate					
Dibenzofuran					
n-Nitroso-diphenylamine				<del>***</del>	
Semivolatiles, Phenolic					
Semivolatiles, Prienolic					
			Andreas Andreas		
2-Methylphenol					
24 Dimental data and					
2,4-Dimethylphenol					
Semivolatiles, Chlorinated					
Tokiezolydnionnalodisphienyk (Poks). Neodrelnoughienoug (E).					

Table ES-1
Site-Specific Contaminants of Interest and Indicator Chemicals

	Environmental Medium at the Quendall Site					
Chemical	Groundwater	Soil	Bulk Sediment	Sediment Porewater/ Surface Water		
Volatiles, Aromatic and Halogenated		·				
indikansi sala ka sala		\$2.5 <b>\</b> \$3.5				
Ethylbenzene						
Toluene						
Dichloromethane						
Carbon Disulfide						
Xylenes						
Styrene						
Methylene Chloride						
Chloroform						
Other						
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#### Notes:

Indicator chemicals are shaded.

The media associated with each indicator chemical are denoted with an "X".

**CAEPA - California Environmental Protection Agency** 

cPAH - carcinogenic PAH(s) (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[a,h] anthracene, and indeno [1,2,3-c,d]pyrene)

ESBQ - equilibrium partitioning sediment benchmark (ESB) quotient

HPAHs - high-molecular-weight PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[g,h,i]perylene, chrysene, dibenz[a,h]anthracene, indeno[1,2,3,-c,d]pyrene, fluoranthene, and pyrene)

LPAHs - low-molecular-weight PAHs (acenaphthylene, acenaphthene, anthracene, fluorene, naphthalene, and phenanthrene)

TEQ - toxicity equivalency quotient

<sup>&</sup>lt;sup>1</sup> Soil conditions at the Site are characterized by high organic content, supporting a reducing environment, and neutral pH. Because the oxidizing environment required to maintain chromium (VI) is not present at the Site, chromium (VI) was not retained as a contaminant of interest.



#### WHAT IS "ALL APPROPRIATE INQUIRIES"?

"All appropriate inquiries" is a process of evaluating a property's environmental conditions and assessing potential liability for any contamination. All appropriate inquiries must be conducted to obtain certain protections from liability under the federal Superfund Law (CERCLA).

#### WHY DID EPA ESTABLISHING STANDARDS FOR CONDUCTING ALL APPROPRIATE INQUIRIES?

The 2002 Brownfields Amendments to the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) require EPA to promulgate regulations establishing standards and practices for conducting all appropriate inquiries.

#### WHEN IS THE ALL APPROPRIATE INQUIRES RULE EFFECTIVE?

The final rule is effective on November 1, 2006, one year after its publication date in the Federal Register.

#### WHAT ARE THE DOCUMENTATION REQUIREMENTS FOR ALL APPROPRIATE INQUIRIES?

The final rule requires that the results of an all appropriate inquiries investigation be documented in a written report. The specific reporting requirements for all appropriate inquiries are provided in 40 CFR §312.21 (Results of Inquiry by an Environmental Professional) and §312.31 of the final rule and include:

- I. An *opinion* as to whether the inquiry has identified conditions indicative of releases or threatened releases of hazardous substances on, at, in, or to the subject property.
- II. An identification of *data gaps* (as defined in §312.10) in the information collected for the inquiry that affect the ability of the environmental professional to identify conditions indicative of releases or threatened releases of hazardous substances on, at, in, or to the subject property, as well as comments regarding the significance of these data gaps.
- III. Qualifications and signature of the environmental professional(s). The environmental professional must place the following statements in the document and sign the document:
  - "[I, We] declare that, to the best of [my, our] professional knowledge and belief, [I, we] meet the definition of Environmental Professional as defined in §312.10 of this part."
  - "[I, We] have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. [I, We] have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312."
- IV. In compliance with §32.31(b), the environmental professional must include in the final report an *opinion regarding additional appropriate investigation*, if the environmental professional has such an opinion.

#### IS THERE A REQUIRED FORMAT FOR REPORTING RESULTS OF ALL APPROPRIATE INQUIRIES?

The final rule requires <u>no</u> specific format, length, or structure of the written report. However, EPA offers the following suggestions regarding the potential content of a written report. The following suggestions generally are consistent with recommendations published in ASTM E1527-05, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process. The ASTM E 1527-05 standard is consistent with the requirements of the final rule and may be used to comply with the provisions of the rule. The following are suggestions regarding format and content of an all appropriate inquiries written report. Please note that the suggestions below do not represent regulatory requirements. Prospective landowners and environmental professionals may design their own format for a written report, as long as the report contains the four documentation requirements listed above (and as noted below).

- > Introduction. An introduction could include descriptions of: the purpose and objectives of the assessment; scope of services provided; methodology used to complete the inquiry; any significant assumptions made; limitations and exceptions; any modifications or deviations from the final rule requirements or from the ASTM E 1527-05 process; special terms and conditions; and information obtained from the landowner or user. The environmental professional and the person(s) who conducted the site reconnaissance and interviews may be identified.
- > Site Description. This section may describe the property location; site and vicinity characteristics; structures, roads, site improvements, and utilities; current and historic use(s) of the property; site topography, geology, and surface/ground water resources; and current and historic use(s) of adjacent properties.
- > User-Provided Information. The report may describe any information provided by the prospective landowner, or user, to the environmental professional. This information may include: title records; information of recorded environmental cleanup liens; recorded activity and use limitations (e.g., engineering controls, land use restrictions, institutional controls); specialized knowledge or experience held by the user related to the property or nearby properties; commonly known or reasonably ascertainable information; and relationship of the purchase price to the fair market value of the property, if it were not contaminated.
- > Records Review. The written report may include a section that summarizes the information found during the records review. This section may describe records that were reviewed to complete the inquiry including: physical setting sources (e.g., topographic maps); historical use sources (e.g., aerial photographs, fire insurance maps, street directories, newspaper archives); federal, state, tribal, and local records or databases of government records; and other environmental record sources (e.g., prior investigation reports, tank/transformer inventories, spill records, permits, etc.).
- > Site Reconnaissance. The written report may include a section dedicated to describing the methodology used to conduct the visual inspection of the subject and adjoining properties. The description may include: when and who performed the reconnaissance; physical imitations (e.g., snow-covered ground, limited access, safety concerns, etc.); general site setting; exterior observations; and interior observations. Additional information on evidence of staining, spills, odors, stressed vegetation, corrosion, pools of liquids, discolored water, ground surface alterations, and other conditions that might suggest a release or threatened release of hazardous substances also may be provided.
- > Interviews. A summary of the interviews conducted could include a description of when and with whom the interviews were conducted (e.g., current property owner and occupants, site manager, attorneys, financial manager, local/state/federal government officials, past site owners and

- occupants) and the method used to conduct the interviews (e.g., in person, written, telephone). If property is abandoned, this section may describe which neighboring property owners were interviewed and if applicable, which past owners and occupants were interviewed.
- Findings. A findings section could describe the results of the assessment including the identified known or suspected recognized environmental conditions, historical recognized environmental conditions, and de minimis conditions. This section also may include findings related to, but not limited to: current and historic site usage; adjoining and nearby properties; hazardous substances and petroleum products; non-hazardous, solid, and hazardous waste management; water pollution; pits, ponds, and lagoons; drains and sumps; waste water; wells; septic systems; spills or releases; air emissions; storage tanks and drums; soil and groundwater contamination, polychlorinated biphenyls (PCB) contaminants, or other contaminants.
- > Opinion of the Environmental Professional. In compliance with the all appropriate inquiries final rule at §312.21(c)(1), the written report must include the environmental professional's opinion(s) as to whether the inquiry identified conditions indicative of releases or threatened releases of hazardous substances on, at, in, or to the subject property. The opinion likely will be based on conditions identified during the inquiries (and potentially noted in a findings section), and include a discussion of the logic, reasoning, and rationale used by the environmental professional in developing the opinion. The environmental professional also must include in the final report an opinion regarding additional appropriate investigation to detect the presence of contamination at the property, if the environmental professional has such an opinion.
- > Data Gaps. As required in §312.21(c)(2) of the final rule, the report should document and discuss significant data gaps that affect the ability of the environmental professional to identify conditions indicative of releases or threatened releases.
- > Conclusions. A conclusions section may be included that summarizes all identified conditions indicative of releases or threatened releases of hazardous substances (or recognized environmental conditions) connected with the property. The final rule does not require that any specific statements be made regarding these conditions, however, ASTM E 1527-05 requires that the report include one of the following written statements:
  - o "We have performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E 1527 of [insert address or legal description], the property. Any exceptions to, or deletions from, this practice are described in Section [] of this report. This assessment has revealed no evidence of recognized environmental conditions in connection with the property," or
  - o "We have performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E 1527 of [insert address or legal description], the property. Any exceptions to, or deletions from, this practice are described in Section [] of this report. This assessment has revealed no evidence of recognized environmental conditions in connection with the property except for the following: (list)."
- Additional Services. If applicable, it may be useful to include a description of any additional services performed as part of the assessment that are beyond the scope of the final rule, and were contracted for between the user and the environmental professional. Additional services could include, but are not limited to: non-scope considerations (e.g., lead-based paint, mold, radon, asbestos, regulatory compliance assessment, indoor air quality, etc.); broader scope of assessment; liability or risk evaluations; Phase II sampling and analysis; health and safety; evaluation of remediation techniques; etc.
- > References. A reference section may be included that lists the published sources relied upon to complete the assessment.

- > Signature(s) and Qualifications of the Environmental Professional(s). Include the statements and environmental professional(s) signature required by §312.21(d), as discussed above in "What are the Documentation Requirements for All Appropriate Inquiries?"
- > Appendices. Appendices could include: regulatory records documentation; environmental database report; site map/plan; vicinity maps; site photographs; historical source documentation (building department records, local street records, chain of title documents, property tax records, zoning/land use records, aerial photos, fire insurance maps, USGS topographical maps); interview documentation; and qualifications of the environmental professional(s).

#### **CONTACT INFORMATION**

Patricia Overmeyer
U.S. EPA's Office of Brownfields Cleanup and Redevelopment
(202) 566-2774
Overmeyer.Patricia@epa.gov

Also see U.S. EPA's website at www.epa.gov/brownfields for additional information.

Brownfields Fact Sheet AAI: Reporting Requirements and Suggestions on Report Content Solid Waste and Emergency Response (5105) EPA 560-F-06-244 November 2006 www.epa.gov/brownfields



#### Environment Education Guide

# Protecting Washington's waters from stormwater pollution

Did you know Washington has a stormwater runoff problem?

Stormwater runoff is damaging salmon habitat. It's the Number 1 water pollution problem in the urban areas of our state, and it causes and contributes to flooding.

Chances are pretty good you've seen stormwater runoff. It's the water from rain or snow that runs off yards, roofs and roadways. As gravity pulls it downhill into low spots, ditches and storm drains, the water picks up soil, chemicals and other pollutants and carries them into our lakes, rivers and marine waters.

Our waters and salmon aren't the only things at risk. Stormwater problems also affect the health and safety of people.

As we develop land to accommodate Washington's growing population, our state's stormwater problem grows, too. The good news is we can do something about it—all of us.

In Washington, the state Department of Ecology, the U.S. Environmental Protection Agency and local governments all work together to regulate stormwater.

The key to solving the problem isn't really in the rules and permits. It's in people—how we live on the land and the everyday choices each of us makes.

#### From rain to runoff — what comes down must go somewhere...

If you want to understand stormwater, watch what happens the next time it rains. Pay attention to how shapes and surfaces determine what happens to the water.

Watch how rainwater flows downhill and collects in low places. See how quickly it starts running down a downspout or into a gutter. Feel how pavement stays hard but soil gets soft. Pay attention to what the water sweeps along in the gutter and where there's an oily sheen on a puddle. Notice what happens to streams and rivers. Notice how runoff seems to be everywhere in the city and is harder to find in the forest.



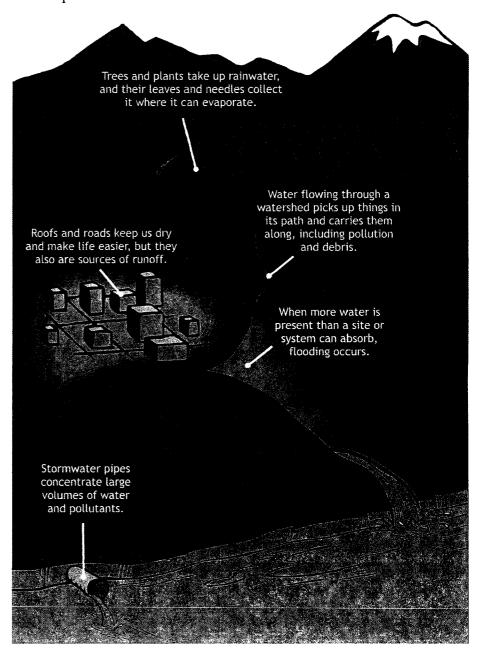
In Washington's forests, the needles of evergreen trees hold a lot of rain—as much as 40 percent of a low intensity rainfall.

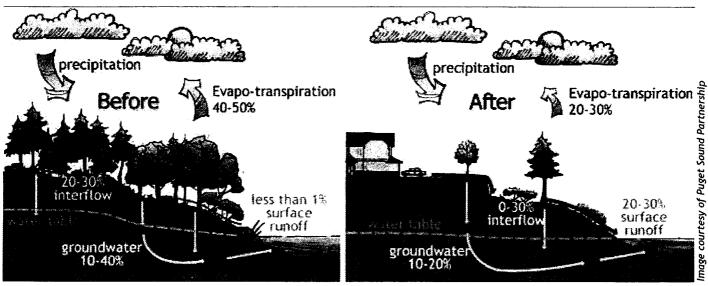
A watershed is all the land that drains to the same body of water. A watershed's natural drainage system includes a network of streams and rivers. In a large watershed, many different sources and land uses can contribute to stormwater runoff.

### The landscape connection is the key to stormwater runoff

On undeveloped sites, water from rain or snow follows natural patterns of drainage and circulation. Much of the water seeps down into the soil and into underground water supplies. In forests and grasslands, trees and other plants will take up some of this water. Water will also collect on their leaves and needles and evaporate.

Wetlands absorb and hold runoff. In a natural or nearnatural setting, the water that does run off directly into streams or other waters is usually filtered and slowed by the web of plants it runs through, a sort of natural purifying system.





**Before** development almost all rainfall is taken up by plants, evaporates or infiltrates through the ground. **After** conventional development, surface runoff increases significantly while evaporation and infiltration into the ground decrease.

Developing land typically has meant removing trees or other vegetation, reshaping the land, compacting soil, and creating hard surfaces. These changes alter the natural water patterns, or hydrology, of a site. Much of the water that plants and soil previously would have absorbed now runs off into local waters, either directly or through a system of gutters, ditches, swales, or pipes. These systems collect runoff and concentrate the flow, quickly conveying it into streams or other waters.

Covering as little as 10 percent of a watershed with impervious surfaces can degrade streams, harming salmon, trout and other aquatic life.

The way we use and develop the land changes not only where stormwater goes and how fast it gets there, but also what it meets along the way—parking lots, roads, roofs, farms, ranches, ball fields and more. Whatever stormwater runoff picks up from these places, it carries into Washington's waters.



Water flowing through a watershed picks up things in its path and carries them along, including pollution and debris.

#### How much stormwater do we make?

POTENTIAL RUNOFF	1,200-square ft. roof	1-acre of pavement
1 inch of rain or snow melt	748 gallons	27,150 gallons
Average annual precipitati	on	
Seattle (37 in./yr)	27,700 gallons	1 million gallons
Spokane (17 in./yr)	12,700 gallons	0.5 million gallons
Olympia (51 in./yr)	38,100 gallons	1.4 million gallons

Roofs, roads and paved parking lots keep us dry and make life easier, but they are also common sources of runoff. Imagine all the roofs and roads in your area and across the state, and imagine how much runoff they generate. Precipitation data source: NOAA - Average annual precipitation, 1971-2000. Figures have been rounded.

#### Washington's growing problem with stormwater runoff

#### Altered flows — too much, too soon and too little, too late

Stormwater often gets to where it's going faster after an area is developed. Runoff quickly flows into streams and other surface waters instead of seeping into the ground to recharge groundwater and slowly feeding those streams year round.

The results include much higher stream flows and flooding when it rains (especially during heavy rains), and much lower stream flows in the dry season. These extreme high and low flows are bad for salmon, trout and other fish as well as people and communities.

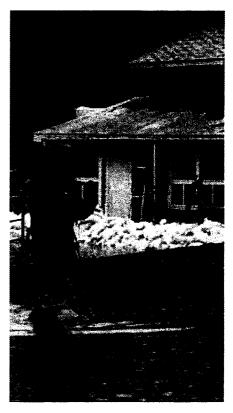
The high-energy, faster, heavier flows erode stream channels and scour streambeds, churning up silt and damaging spawning areas. The energy from high flows also flushes away tiny aquatic life that serve as part of trout and salmon's diets and part of a healthy stream.

Extreme low flows are also a problem for fish. Some urban streams that used to run year round sometimes dry up in the summer. Others have too little flow to allow salmon to swim up them to spawn. Hardened surfaces contribute to this problem by interrupting the natural water-absorbing process. Rainfall hits these hard surfaces and escapes directly into rivers rather than soaking into the ground to recharge underground water supplies that feed small streams in the summer months.

#### Did you know ...?

- Economic costs related to stormwater in the Puget Sound region are expected to exceed \$1 billion over the next decade.\*
- Even the drier east side of the state has to deal with stormwater, especially in urban areas. If laid end-to-end, Spokane's storm sewers would stretch all the way to Seattle and back.

There are other flow-related impacts, too. Flooding from extreme high flows can damage private property, public roads and utilities. And when stormwater runs off instead of seeping into groundwater, some wells may go dry.



With high amounts of hardened or paved surfaces, urban areas generate more and faster runoff, increasing the risk of flooding.



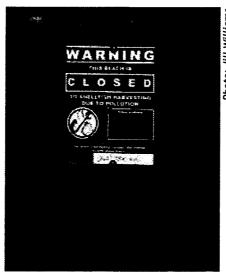
#### Polluted waters

Most stormwater runoff carries pollution and more pollution comes from highly urbanized areas. More importantly, most of it is not treated, or "cleaned up" before it enters Washington's waters.

Stormwater runoff is the Number 1 urban water pollution problem in the state.

As runoff flows over roofs, pavement and developed land, it picks up soil particles, oil and grease (mostly from cars and trucks), and many different toxic chemicals, including those from fertilizers, weed-killers, and pesticides. It also picks up bacteria from pet and livestock waste and failing septic systems.

About one-third of the state's waters are too polluted to meet state water quality standards. Frequently, the cause of this pollution is stormwater. This water is not fit for drinking or swimming.



Contaminated stormwater runoff can create hazards to human health and affect recreation, tourism, fishing, and businesses.

Beaches have been closed for swimming and shellfish harvesting.

Salmon suffer not only from chemical pollutants, but also from soil washed in from construction sites and other bare ground. Mud can cover spawning areas, suffocating salmon eggs. It also can clog gills, making it harder or impossible for salmon, trout, and other fish to breathe.



Polluted stormwater runoff is an issue across the state. It's easy to see how it connects to issues about Puget Sound, the Spokane River, the Columbia River, and salmon recovery. Stormwater runoff connects to other issues, too:

- Many of the same things that pollute runoff and surface waters can also pollute aquifers, which are sources of drinking water.
- The danger from landslides and unstable slopes increases in areas with stormwater problems.
- As we prepare for climate change, we must consider how changes in rain and snowfall could affect flooding and water supplies.

The good news is that solutions for stormwater can help us deal with many of these connected issues.



Salmon and trout need cool water to survive, but stream temperatures can rise when cool groundwater isn't available to feed a stream year round. Also, stormwater runoff entering a stream is often warmer than the stream itself.

#### Rethinking stormwater runoff

Dealing with stormwater has traditionally focused on getting it out of the way quickly. In Washington, many communities have rules for managing stormwater as part of regulating development and preventing erosion and flooding.

However, many communities are not as used to dealing with stormwater runoff as a major source of pollution or destroyer of habitat. With increasing stormwater runoff problems and new state and federal requirements, Washington is rethinking how it handles stormwater.

Washington has successfully tackled other pollution problems. By combining regulations with cooperation, creativity and good long-term planning, we can reduce the problems with stormwater runoff.



Our transportation choices are part of the runoff picture. Many pollutants in runoff from roads, driveways and parking lots come from cars and trucks. Some sources are:

- Antifreeze
- Brake fluid
- Brake lining
- Exhaust particles
- Oil
- Pavement particles
- Tire particles
- Transmission fluid

#### A new approach - reduce runoff at its source

Stormwater runoff accumulates, and so do the problems it creates as it flows downhill. It makes sense to try to stop the problems before they start or get too big to manage.

Innovative developers, engineers and designers are already looking at ways to reduce runoff at its source and better mimic nature's systems by:

- Retaining more natural vegetative cover.
- Reducing hardened surfaces and soil compaction.

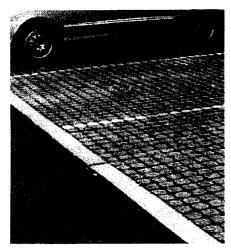
• Keeping more stormwater on site to percolate into the ground.

Better designs for new developments can make a difference for the future, but improvements to existing developments can help deal with today's stormwater problems, too. The Department of Ecology is providing grants to local governments to help fund innovative approaches to preventing stormwater runoff.



Seattle's SEA (Street Edge Alternatives) Streets pilot project reduced the amount of stormwater runoff leaving a street by 98 percent for a small rain event. This successful project has inspired similar projects, and the City expects that future projects will cost less than traditional street improvements.

Photo: Seattle Public Util



Permeable pavement like this provides a hard, drivable surface, but it also lets some stormwater soak back into the ground.

#### Choices for the future

Stormwater pollution often goes hand in hand with growth. Since 1982, Washington's population has grown by two million people, adding the equivalent of 10 new cities the size of Spokane or Tacoma. Millions more people are expected to be added in the next few decades. As the state's population grows, we can choose to limit polluted runoff and the harm it does, or risk losing some of what makes Washington a special place to live.

While new regulations and technologies can help, we can't expect them to completely make up for the impacts of converting forests and grasslands into shopping malls or subdivisions.

Choices we make about how we use the land, including how much development to allow, where it occurs, and how much vegetated land is retained, are crucial for successfully managing stormwater and for keeping Washington's watersheds healthy.

#### Washington Waters — Ours to Protect

People really can make a difference when it comes to reducing stormwater runoff and the problems and costs that go with it. Because we all contribute to the problem, we all can be a part of the solution. It starts with paying attention to stormwater - at home, at work and in our communities.

#### We can reduce the amount of runoff.

- Reduce the amount of paved or hard surface areas. Consider permeable paving for that new patio or driveway.
- Look for ways to keep runoff out of the stormwater system so it can soak into the ground. Plant rain gardens. Use rain barrels. Wash your car on the lawn or at commercial car wash that recycles water. (This helps prevent runoff pollution, too!)

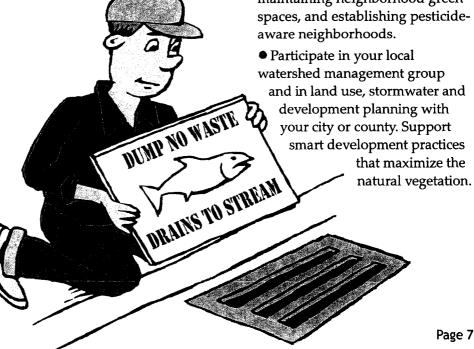
#### We can create cleaner runoff.

- Reduce fertilizers, turf builders and pesticides on your lawn and garden. Use small amounts of slow-release fertilizer and environment-friendly products for problem areas.
- Reduce pollution from roads, driveways and parking lots. Wear and tear on roads, tires and brakes leaves a lot of pollutants behind. Fix vehicle fluid leaks immediately, and consider alternatives to driving solo.
- Reduce bacterial pollution from animal waste. Scoop pet waste and put it in your garbage. Cover and control animal manure on small farms.
- Maintain your septic system. This will keep it from failing and causing pollution.

#### We can work together.

 Get involved with community stormwater projects such as marking storm drains, maintaining neighborhood green spaces, and establishing pesticideaware neighborhoods.

 Participate in your local watershed management group and in land use, stormwater and development planning with your city or county. Support smart development practices that maximize the natural vegetation.



#### For more information

#### Washington Department of Ecology

Water Quality Program www.ecy.wa.gov/programs/wq/stormwater/index.html

**Melanie Forster** 

Stormwater Community Outreach and Environmental Education Specialist 360-407-7529

Sandy Howard

Public Information Manager 360-407-6408

#### Watershed planning

To find out what watershed you live in and how to get involved: www.ecy.wa.gov/watershed/index.html

#### Helpful websites

Puget Sound Partnership www.psp.wa.gov/our\_work/stormwater.htm

• U.S. Environmental Protection Agency cfpub1.epa.gov/npdes/home.cfm?program\_id=6

Seattle Public Utilities SEA Streets Project

 Seattle Public Utilities Project

 Seattle Public Utilities Project

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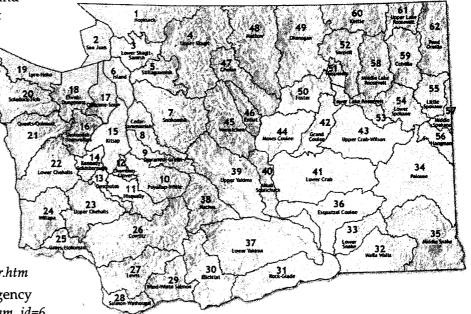
 $www.seattle.gov/util/About\_SPU/Drainage\_\&\_Sewer\_System/Natural\_Drainage\_Systems/Street\_Edge\_Alternatives/index.asp$ 



- For local information, contact your city or county.
- Search the Internet for more information on stormwater, runoff, rain gardens, low impact development, etc.

If you need this publication in an alternate format, please call (360) 407-7006. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call (877) 833-6341.

Water Resource Inventory Areas are administrative and planning boundaries for water basins, commonly known as watersheds.



February 3, 2012

SWMMWW Comments Department of Ecology Water Quality Program PO Box 47696 Olympia, WA 98504-7696

RE: Comments on Ecology's Draft 2012 Stormwater Management Manual for Western Washington

Dear Ecology Staff:

The City of Renton appreciates having the opportunity to review the 2012 Draft Stormwater Management Manual for Western Washington.

The City of Renton has reviewed the 2012 Draft Stormwater Management Manual for Western Washington that is proposed to be finalized and issued in July 2012. The City of Renton has many concerns related to the new guidelines, technical standards, requirements, and the manual adoption process. We request that these concerns, along with the concerns of other jurisdictions, be resolved prior to the Draft Stormwater Manual being finalized and made a mandatory regulatory requirement in the proposed new NPDES Phase II Municipal Stormwater Permit.

The Draft 2012 Stormwater Management Manual for Western Washington is incomplete. The proposed language includes numerous references to "Low Impact Development Standards" (LID) defined in the 2012 Low Impact Development Technical Guidance for Puget Sound. Multiple sections of the manual (sections 3.1.1, 3.1.2, 3.3.8, 3.4.2, 7.1, 7.9, 9.4, etc.) contain language that reads: "this section will be updated to be complementary with chapter # in the updated Low Impact Development Technical Guidance Manual for Puget Sound". The Low Impact Development Technical Guidance for Puget Sound is currently under the review process and has not yet been finalized and adopted. It is impossible to fully understand the LID design criteria, technical requirements, and cost associated with implementing the LID requirements referenced in the Draft Stormwater Manual due to-the missing LID information.

Washington State Dept. of Ecology Page 2 of 3 February 3, 2012

The Ecology workshop, the Ecology website, and the manual itself refer to the manual as a guidance document. However, the Ecology website and the presentations made at public workshops by Ecology staff, clearly indicates that the updates made to the 2012 Stormwater Management Manual for Western Washington are proposed so that the proposed Draft Stormwater Manual technical standards will be incorporated in the proposed new NPDES Municipal Stormwater Permits. Therefore, it is clearly Ecology's intent that this manual will be used as a regulatory document, and as such must go through the appropriate review processes, including SEPA review, economic impact assessment, and be adopted in accordance with the state's Administrative Procedures Act for rulemaking.

The City of Renton requests that Ecology defers the adoption of the proposed Draft 2012 Stormwater Management Manual for Western Washington and not make it a regulatory requirement in the proposed new 2013-2018 NPDES Phase II Municipal Stormwater Permit until the document is complete. Prior to moving forward with finalizing the Draft Stormwater Manual, Ecology needs to revise the manual to include all language and guidelines in the manual; address comments and concerns from jurisdictions; complete and adopt the Low Impact Development Technical Guidance for Puget Sound through the state's formal rulemaking procedure; develop, provide for technical review and finalize a new Western Washington Hydrology Model that will allow for the modeling of LIDs and; the standards for applying the LID performance standards are developed for technical review. After all items listed above are accomplished, the manual should go through a new public review process that will allow a complete review of all proposed requirements that are proposed to be included in the Draft 2012 Stormwater Management Manual for Western Washington followed by a formal rulemaking process.

The current NPDES Phase II Municipal Stormwater Permit already far exceeds the minimum federal requirements as established by the EPA and to increase the regulatory requirements will only create more of an economic disadvantage to the State of Washington to retain existing business and recruit new businesses and will harm economic recovery.

For the reasons listed above, we recommend that Ecology delay the issuance of the proposed new NPDES Phase II Municipal Stormwater Permit for 5-years and extend the current NPDES permit requirements for the next 5-year NPDES permit cycle. This will allow more time to address concerns about the proposed new NPDES permits; refine and gain concurrence on the new technical standards in the proposed LID manual and the proposed Draft 2012 Stormwater Management Manual for Western Washington;



Washington State Dept. of Ecology Page 3 of 3 February 3, 2012

ensure the technical accuracy of these manuals and the feasibility of their requirements; and allow for the evaluation of the economic and social impacts associated with the proposed new regulatory requirements.

Attached please find comments identified by the city as major issues of concern with the Draft 2012 Stormwater Management Manual for Western Washington.

We look forward to working cooperatively with Ecology and other jurisdictions to better understand and establish reasonable guidelines to be included in the Draft 2012 Stormwater Management Manual for Western Washington. If you have any questions, please contact me at 425-430-7248.

Sincerely,

Ronald J. Straka, P.E.

Surface Water Utility Engineering Supervisor

Attachment

cc: Gregg Zimmerman, P.E., Public Works Administrator
Lys Hornsby, P.E., Utility Systems Director
Hebé Bernardo, Surface Water Utility Engineer

Manag	Project: Draft 2012 Stormwater Management Manual for Western Washington		Comments By: City of Renton Date: February 3, 2012		Date: February 3, 2012
ltem #	Manual Section	Page number		City of Rentor	n Comment:
# 1	Section Stormwater Management Manual Review Process and Issuance	All	is incompleted references to defined in the Guidance for sections 3.1 language the complement Development The Low limits of the LID designation of the LID requision is missing in adopted, im  The Ecology workshops in made to the preparation stormwater this manual must go the SEPA review process.  Radical incredistrates to just the preparation of the second periods and periods and periods and periods impact to just the second periods and periods a	te. Proposed languation "Low Impact Devine 2012 Low Impact or Puget Sound. Mu.1, 3.1.2, 3.3.8, 3.4. at reads: "this sectitary with chapter # Int Technical Guidan pact Development rently under the red and adopted. It gon criteria and cost sirements reference formation and the aplemented and incomplemented and incomplemented and the plemented and the plemented and the plemented and the post Ecology staff, clee 2012 Stormwater for this document permits. Therefore will be used as a regoing the appropriate, Economic Impact personal proposition of the proposition	Manual for Western Washington age includes numerous elopment Standards" (LID) to Development Technical altiple sections of the manual (see 2, 7.1, 7.9, 9.4, etc.) contain on will be updated to be in the updated Low Impact and Manual for Puget Sound". Technical Guidance for Puget view process and has not yet is impossible to fully understand associated with implementing ed in the DOE manual when there design criteria has not yet been luded in the DOE manual.  Ilogy website, and the manual suidance document. However, resentations made at public arly indicates that the updates Manual for WW were in to be required by the NPDES at it is clearly Ecology's intent that agulatory document, and as such the review processes, including Assessment, and the rulemaking so, compliance with mandatory is will have a significant cost benefit of implementing these is w LID practices will require re-
	To the state of th		training of e will result ir	engineers, develope	ers, builders and City staff which increase in training cost,
			incentivized for projects Ecology Sto	I rather than be req only subject to Mir rmwater manual.	ould be encouraged and uired as mandatory, especially nimum Requirements 1-5 in the The LID code updates should be e of LID by emphasizing potential

Item	Manual	Page	City of Renton Comment:
# "	Section	number	
		Tumber	benefits and providing incentives for their use.  Recommendation:  • Ecology should defer the adoption of the 2012 Stormwater Manual and not be a requirement for the 2013-2018 NPDES Phase II Permit until all language and guidelines are included in
			the manual itself, comments from jurisdictions are addressed, the Low Impact Development Technical Guidance for Puget Sound is adopted, and a new WWHM model that will allow for the modeling of LIDs and the LID performance standards is developed and available to the general public. After all items listed above are accomplished, the manual should go through a second review process that will allow a complete review of the proposed requirements and comply with the state's Administrative Procedures Act for rulemaking.
			• For the reasons listed above (among others) we recommend that Ecology delay the issuance of the proposed new NPDES permit for 5-years and extend the current permit requirements for the next 5-year NPDES Phase II permit cycle. The current NPDES Phase II permit already far exceeds the minimum federal requirements as established by the EPA and to increase the regulatory requirements will only create more of an economic disadvantage to the State of Washington to retain existing business and recruit new businesses and will harm economic recovery.
			We recommend that new LID practices be focused on encouraging the use of LID by emphasizing potential benefits and providing incentives for their use rather than requiring projects to follow mandatory lists.
			Remove LID requirements from the 2012 Stormwater Management Manual for Western Washington. Both performance standards and mandatory list of LID BMPs should be an option for projects implementing MR5. The increased regulatory burden that the proposed 2012 Stormwater Manual will place on counties, cities, property owners, businesses, and citizens will deter new economic growth and impact the ability to retain existing businesses and recruit new businesses to this state. Jurisdictions are currently struggling to provide funding needed to meet the staffing, training equipment, and other costs associated with complying with the current stormwater standards.

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Page 2 of 8

Item #	Manual Section	Page number	City of Renton Comment:
denne i ne ig diel de la de de mender e nard een	i an a anni anni anni anni an		
	Volume I Section 2.3	2-9	<ul> <li>Proposed definition of receiving waters reads: "Bodies of water or surface water systems to which surface water runoff is discharged via point source of stormwater or via sheet flow.</li> <li>Groundwater to which surface runoff is directed by infiltration."</li> <li>Recommendation:</li> <li>Please remove the last sentence from this definition and return</li> </ul>
: Here			it to its original form.
To committee the control of the cont	Volume I Section 2.4	2.4.1 & 2.2.	
To a source of the state of the			<ul> <li>Recommendation:</li> <li>Update language included in the manual to read: "All new development projects triggering a Permit from the local permitting agency shall be required to comply with minimum requirement #2"</li> </ul>
• Control of the cont	Volume I Section 2.5.5	2-34 ▶ 2-3	Both mandatory list #1 and mandatory list #2 appear to include "One-size-fits-all" requirements to be implemented in suburban developments rather than developments in the urban growth areas (like Renton), unless determined to be infeasible. Most sites in urban areas are small, complex, have complicated utility infrastructure and soils are not suitable for infiltration. Therefore, in most cases the implementation of LIDs is not feasible.
	,		<ul> <li>Renton is concerned that Ecology's proposal for compliance with a site-based mandatory list or performance standard will increase staff time to assure compliance with feasibility criteria, increase staff time to review projects, increase cost for developers and builders to comply with mandatory lists, and increase design and construction cost.</li> </ul>
			<ul> <li>The proposal does not provide sufficient guidance for industrial, manufacturing, and other land uses.</li> </ul>
			<ul> <li>Renton is concerned about the availability of sufficient information regarding maintenance, life cycle cost, and structural performance of the required LIDs. Therefore, until more information is available regarding life cycle cost, rehabilitation (structural and surface), maintenance requirements, maintenance cost, funding source and availability of material, LIDs shall not be required but encourage on all projects.</li> </ul>

Item #	Manual Section	Page number	City of Renton Comment:
			Our efforts towards environmental protection of receiving waters must necessarily focus on addressing the flow control and water quality requirements; and encouraging the implementation of LIDs rather than making it mandatory.
			Recommendation:  • We recommend that new LID practices be focused on encouraging the use of LIDs by emphasizing potential benefits and providing incentives for their use rather than requiring projects to follow mandatory lists.
			Remove LID requirements from the 2012 Stormwater     Management Manual for Western Washington. Both     performance standards and mandatory list of LID BMPs should     be an option for projects implementing MR5.
	Volume I Section 2.5.5	2-37	Requiring commercial sites greater than 10,000 sf of hard surface to provide a cost analysis that shows infeasibility for the use of a green roof (when infiltration, dispersion and/or infiltration are not feasible) is too stringent and will not help accomplish the intent and principals of LID implementation. The increased regulatory burden that this requirement will place on developers and businesses may deter new economic growth and impact the ability to retain existing businesses and recruit new businesses to this state.
Control of the contro		The second secon	<ul> <li>Recommendation:         <ul> <li>Remove the requirement for commercial sites to provide a cost analysis to show infeasibility for green roofs.</li> </ul> </li> </ul>
The state of the s	Volume I Section 2.5.5	2-38	Proposed language will require governments to review technical codes to minimize impervious surface and retain native vegetation in all development situations. This requirement may result in less zoning capacity or higher construction cost required for taller buildings, which could affect affordability and/or push more developments (and infrastructure) towards undeveloped areas. This could cause the need to expand the urban growth area boundary and will conflict with the intent of the GMA.
		Community of the same of the s	<ul> <li>Impervious surface limitations and vegetation retention will apply to all projects in addition to mandatory list #1 or mandatory list #2. Projects implementing LIDs in accordance with mandatory list #1 or #2 shall not have a limit to the impervious surface allowed on the lot (other than those required by zoning codes).</li> </ul>

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Item #	Manual Section	Page number	City of Renton Comment:
	Volume I	2-54	<ul> <li>Recommendation:         <ul> <li>We recommend that new LID practices be focused on encouraging the use of LIDs by emphasizing potential benefits and providing incentives for their use rather than requiring projects to follow mandatory lists.</li> </ul> </li> <li>Remove the requirement to "review technical codes to minimize impervious surface and retain native vegetation in all development situations" from the 2012 Stormwater Management Manual for Western Washington. Both reducing the impervious surface allowed on lots and mandatory list of LID BMPs should be an option to be used by applicants, encouraged by the City and not required.</li> <li>Proposed language reads "to determne whether"</li> </ul>
t ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) (	Section 2.8		Recommendation:  • Please correct typo to read "to determine whether"
	Volume I Section 4.2	4-3	Proposed manual language includes available LID credits to be incorporated into WWHM in order to reduce the size of the flow control facility or qualify for the 0.1cfs exemption. Proposed language includes only credits for the implementation of permeable pavement. Clarification is needed on the type of credits available for the use green roofs, rain gardens/bioretention, and limited dispersion (downspout dispersion).
			<ul> <li>Recommendation:</li> <li>Include language that will clearly identify the types of credits available for the implementation of LID facilities such as green roofs, rain gardens/bioretention, and limited dispersion among others. A credit shall also be available for projects reducing the amount of impervious surface on their lots and/or detaining vegetation.</li> </ul>
The state of the s	Volume I Appendix I-F	All	<ul> <li>We recommend the addition of the following to the feasibility criteria for low impact development best management practices to also include:         <ul> <li>Within area designated as erosion hazard area.</li> <li>Within area designated as aquifer protection areas.</li> <li>Within 10 feet of underground utilities.</li> </ul> </li> </ul>
Myther plan can be	Volume II Section 2.1	2-5	Proposed language reads: "disturb less than one acre of land area, if the project or activity is part of a larger common plan or development or sale" this language implies that all lots within a subdivision will be required to apply and obtain a Construction Stormwater General Permit.

Item #	Manual Section	Page number	City of Renton Comment:
			Recommendation:  Remove proposed language from stormwater manual to allow for more flexibility and reduce construction cost and increase regulatory burden.
	Volume II Section 2.1	2-6	Proposed language in first bullet reads: "construction activities that meet the requirements of an Erosivity Waver" The Erosivity Waver was removed from the NPDES Permit language and therefore will not be allowed for projects in the City of Renton.
reduktivi de skoja in jegge djes			<ul> <li>Recommendation:</li> <li>Remove proposed language from stormwater manual to avoid confusion.</li> </ul>
	Volume II Section 3.4.2	3-116	<ul> <li>Proposed manual language will require commercial properties and subdivisions to implement permeable pavement on parking lots, roads and walkways as a first option. This is contrary to what is included in mandatory list #2 which requires projects to verify feasibility for dispersion as a first option.</li> <li>The implementation of LIDs should be encouraged and incentivized rather than be required, especially for projects only subject to Minimum Requirements 1-5 in the Ecology Stormwater Manual. The LID code updates should be focused on encouraging the use of LID by emphasizing potential benefits and providing incentives for their use.</li> <li>Recommendation:</li> <li>Update manual language to encourage the implementation of permeable pavement rather than requiring the implementation of permeable pavement in all commercial and subdivision developments.</li> <li>We recommend that new LID practices be focused on encouraging the use of LIDs by emphasizing potential benefits and providing incentives for their use rather than requiring projects to follow mandatory lists.</li> </ul>
	Volume III Appendix III-B	B-14 ► B-18	This section of the manual is incomplete. This section of the manual (that included the WWHM computation steps) was deleted without the incorporation of guidelines for using the "new" WWHM model, verifying compliance with the LID performance standard (when required) or sizing of LID facilities required to comply with MR#5.
DOWN COLOR OF THE			Recommendation:     Please add a section that incorporates a step-by-step computation method of all required facilities including LIDs

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Page 6 of 8

Item #	Manual Section	Page number	City of Renton Comment:
			(such as permeable pavement) and the new optional LID performance standards.
	The control of the co		Ecology should defer the adoption of the 2012 Stormwater Manual and not make it a requirement for the 2013-2018 NPDES Phase II Permit until all language and guidelines are included in the manual itself, comments from jurisdictions are addressed, the Low Impact Development Technical Guidance for Puget Sound its adopted, and a new WWHM model that will allow for the modeling of LIDs and the LID performance standards is developed and available to the general public. After all items listed above are accomplished, the manual should go through a review process that will allow a complete review of the proposed requirements and comply with the state's Administrative Procedures Act for rulemaking.
The contract of the contract o	Volume III Appendix III-C	C-15	<ul> <li>Approved list of approved trees that may qualify for a flow control credit was not included.</li> <li>Recommendation:         <ul> <li>Please update section to include list of approved trees that may qualify for a flow control credit.</li> </ul> </li> </ul>
			Ecology should defer the adoption of the 2012 Stormwater Manual and not be a requirement for the 2013-2018 NPDES Phase II Permit until all language and guidelines are included in the manual itself, comments from jurisdictions are addressed, the Low Impact Development Technical Guidance for Puget Sound its adopted, and a new WWHM model that will allow for the modeling of LIDs and the LID performance standards is developed and available to the general public. After all items listed above are accomplished, the manual should go through a review process that will allow a complete review of the proposed requirements.
The state of the s	Volume III Appendix III-C	C-16	<ul> <li>Equation for impervious area mitigated or the credit per tree type needs to be revised. As written, after replacing the credit available per newly plant tree, the impervious area mitigated will be a percentage which we do not think is the intent. Please see example below with the assumption that 50 trees will be planted.</li> <li>Impervious area mitigated = Σ Number of trees x credit (%)/100 Impervious area mitigated = 50 x 20sf per tree % /100 = 100%</li> </ul>
The state of the s			<ul> <li>Recommendation:         <ul> <li>Please revise impervious area mitigated formula to read as follows: Impervious area mitigated = Σ Number of trees x credit area per tree</li> </ul> </li> </ul>

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Page 7 of 8

Item #	Manual Section	Page number	City of Renton Comment:
•	Volume III Appendix III-C	C-22	Proposed language will allow for projects using the soils and compost specifications as defined in Chapter 7 of Volume V to assume an initial infiltration rate of six inches per hour or four inches per hour depending on the scope of the project. This approach is not taking under considerations the infiltration capacity of the soils below the media. This may result in undersize facilities and flooding.
			Recommendation:  Please update permit language to:  Allow for projects with soils below the media with an infiltration rate smaller than six inches per hour to use an average infiltration rate between the soils below the media and six inches per hour or four inches per hour depending on the scope of the project.  Restrict projects with soils below the media with an infiltration rate greater than six inches per hour to use a maximum infiltration rate of six inches per hour.
•	Volume V BMP T7.30	7-8	<ul> <li>Proposed language reads: " help achieve compliance with the Performance Standard option of minimum requirement #5" this implies that all projects have to comply with the LID Performance Standards. Only projects outside the UGB are required to show compliance with the LID performance standards. For projects inside the UGB this is optional.</li> </ul>
			Recommendation:  • For clarification, please revise language to read:" help achieve compliance with the Performance Standard option of minimum requirement #5, when required"



#### UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 10

1200 Sixth Avenue, Suite 900 Seattle, Washington 98101-3140

Reply To: ECL-111

13 January 2011

Vanessa Dolbee, Senior Planner
City of Renton Dept. of Community & Economic Development
Renton City Hall – 6<sup>th</sup> Floor
1055 South Grady Way
Renton, WA 98057

Dear Ms. Dolbee:

Thank you for the opportunity to comment on the December 2010 Draft Environmental Impact Statement (DEIS) for the Quendall Terminals proposal. As you know and as mentioned in the DEIS, Quendall Terminals is listed on the National Priorities List and as such is a federal Superfund site (Quendall Superfund Site). EPA is in the process of determining the clean up for the Site to ensure protection of human health and the environment. Until EPA makes a cleanup decision, it seems that it would be difficult for the Proponent or the City of Renton to accurately define a baseline. For example, EPA will not know what actions or restrictions will occur at Quendall Terminals until the cleanup decision is finalized and implemented. Therefore, the final Environmental Impact Statement (EIS) should clearly describe up front that the EIS's baseline assumptions that are tied to EPA's final cleanup decisions may change. Also, EPA recommends that the assumptions listed below also be included up front so that readers of the final EIS clearly understand which components of the baseline may change due to cleanup actions.

EPA and the current property owners, who are also potentially responsible parties (PRPs), are in the process of completing a Remedial Investigation Report, including a Risk Assessment Analysis, (RI) and a Feasibility Study (FS). These Reports include information about the nature and extent of contamination and potential risks associated with exposure to that contamination and an evaluation of the remedies that could be implemented to mitigate contamination associated with Quendall Terminals. After the RI and FS Reports are approved, EPA will issue a Proposed Plan (PP) which will identify the steps that must be taken to ensure that the Quendall Terminals Site will be protective of human health and the environment. When the PP is finalized the public will be given a 30 day period to provide comments to EPA and a public meeting will be held, if requested. After EPA reviews all public comments, EPA will issue a Record of Decision (ROD) specifying the remedial action chosen to be implemented at the Site. EPA

1

2

anticipates that the ROD will be issued in mid-2012. After the remedy is established in the ROD, EPA and the PRPs will enter into an agreement for the implementation of the remedy.

2 cont.

3

EPA has reviewed sections of the DEIS that appear to be relevant to the Superfund project at Quendall Terminals. The DEIS does indicate that Quendall Terminals is a Superfund Site and that cleanup actions will occur at the Site in the future. EPA understands that the DEIS is a part of the process that is needed for Quendall Terminals to be commercially developed after the cleanup is completed. Also, as part of the EIS process, a baseline must be described against which the EIS is evaluated and from which a mitigation plan is approved for any post-cleanup redevelopment of the Quendall Terminals Site. In the case of Quendall Terminals, the baseline reflects assumed postcleanup conditions at Quendall Terminals. Many of these assumptions are based on preliminary discussions with EPA in anticipation of potential future cleanup actions. Consequently, actual post-cleanup conditions at Quendall Terminals will not be known with certainty until the cleanup has been conducted. Some post-cleanup site conditions may be ascertained with some certainty in the ROD. Therefore, the assumptions in the DEIS for Quendall Terminals were developed with the knowledge that those assumptions that establish the baseline could be significantly different than post-cleanup site conditions. Accordingly, if the assumptions supporting the DEIS baseline significantly change, EPA understands that the EIS for Quendall Terminals would need to be modified to reflect actual post-cleanup conditions.

EPA is providing the following comments to help clarify certain post-cleanup assumptions used in the DEIS. The baseline in the DEIS assumes that:

1) a soil (sand) cap will be placed over the "entire Main Property"

EPA comment: the nature and extent of the cap is unknown at present

2) a shoreline cap of 3.2 acres will be installed and will consist of organoclay, sand, gravel, and topsoil.

EPA comment: the nature and extent of the cap is unknown at present

3) three stormwater outfalls will discharge to the wetlands/lake.

EPA comment: the location and number of stormwater outfalls may be determined as part of the cleanup actions at Quendall Terminals.

4) setbacks for buildings, roads, parking and wetlands will be a specified distance from the shoreline

EPA comment: setback distances for various components of potential redevelopment can only be determined after the remedy has been implemented.	7 cont.
5) there will be a publically accessible trail along the shoreline and physical access to the shoreline of Lake Washington.	8
EPA comment: the nature and accessibility of private or public access to the shoreline or nature trail will be generally determined in the ROD and specifically in remedial design. Trustees or other Agencies may also have input into nature trail and/or shoreline access.	
6) a specific plan for shoreline/habitat mitigation/restoration with particular acreage assigned to different parties to compensate for wetlands that were filled as part of the cleanup action or to compensate for previous damages.	9
EPA comment: Figures showing potential shoreline mitigation/restoration specifications, such as in Figures 2-6, 2-7, 2-11, and 2-12, are very detailed. The final specifications for shoreline mitigation/restoration may not be determined until the ROD and could possibly be modified based on in-field implementation issues. Trustees or other Agencies will be consulted and may also have input into the final specifications of any shoreline mitigation/restoration. EPA did not assist in developing the assumptions for wetland mitigation/restoration. The assumptions used in the DEIS are solely the responsibility of the applicant.	
7) certain institutional controls and details of Operations and Maintenance Plans (OMPs) including Best Management Practices will result from the cleanup actions at Quendall Terminals.	10
EPA comment: Details regarding institutional controls and the Quendall Terminals OMP will not be finalized until the completion of remedial action. However, it should be noted that EPA will prohibit underground construction (except for utility corridors and piling support structures) if contamination above safe levels is left in subsurface soils or groundwater.	
8) the ROD documenting the cleanup action will be available in late 2011.	11
EPA comment: Best estimates, at present, are that the ROD will not be approved until mid-2012.	
9) there will be no use of Lake Washington.	12
EPA comment: Restrictions on the use of Lake Washington adjacent to Quendall Terminals will not be known until the ROD is approved.	

The DEIS also states several times that "(a)s part of the cleanup process applicable cleanup methods will consider potential redevelopment plans" and "(a)s part of redevelopment, a pedestrian corridor/trail will also be constructed along the Lake Washington Shoreline during cleanup/remediation." The Superfund Program encourages coordination, to the extent practicable, between Superfund and PRPs seeking to redevelop a Superfund site after the site has been remediated. However, the extent to which coordination can be successful depends on ensuring that protection of human health and the environment are not compromised.

Again, EPA appreciates the opportunity to submit comments and wants to acknowledge the significant work done by the Applicant and the City of Renton to try and reflect post-cleanup conditions at Quendall Terminals. Please call me at 206-553-1987 if you have any questions or concerns regarding EPA's comments. A formal letter will follow.

Sincerely,

Lynda Priddy Remedial Project Manager

cc: Barbara Nightingale, Department of Ecology Jessica Winter, NOAA Glen St. Amant, Muckleshoot Tribe Clay Patmont, Anchor QEA

## ENVIRONMENTAL IMPACT STATEMENT ADDENDUM

# Quendall Terminals



Renton, Washington

October 2012

prepared by

City of Renton
Department of Community and Economic Development

# CHAPTER I

#### **SUMMARY**

#### **CHAPTER 1**

#### **SUMMARY**

#### 1.1 INTRODUCTION

This chapter provides a summary of the Quendall Terminals Redevelopment Project EIS Addendum. It briefly describes the project history and the Preferred Alternative, and provides an overview of probable significant environmental impacts, mitigation measures, and significant unavoidable adverse impacts of the Preferred Alternative. See **Chapter 2** of this EIS Addendum for a more detailed description of the Preferred Alternative; **Chapter 3** for updated information and analysis; and, **Chapter 4** for a comparison of potential environmental impacts, mitigation measures, and significant unavoidable adverse impacts under the Preferred Alternative to those under DEIS Alternatives 1 and 2.

This document is an Addendum to the Draft EIS (DEIS) that was prepared for the Quendall Terminals Redevelopment Project (December 2010). According to the SEPA Rules (WAC 197-11-600 and 197-11-706), an Addendum is an environmental document that is used to provide additional information or analysis that does not substantially change the analysis of significant impacts and alternatives in an existing environmental document. Preparation of an Addendum is appropriate when a proposal has been modified and the changes are not expected to result in new significant adverse impacts.

The DEIS evaluated two redevelopment alternatives and their environmental impacts and associated mitigation measures. Subsequent to the issuance of the DEIS, a Preferred Alternative was developed by the applicant based on additional agency/community input (particularly from the U.S. Environmental Protection Agency, EPA), and input and continued coordination with the City of Renton. Many of the redevelopment assumptions under the Preferred Alternative would be similar to those described in the DEIS for the redevelopment alternatives, in particular Alternative 2. Similar to DEIS Alternatives 1 and 2, the Preferred Alternative is intended to be a compact urban mixed-use development with a mix of residential, retail, and restaurant uses, and would be planned to ensure that future redevelopment is compatible with the environmental remediation effort that is currently underway at the site. The Preferred Alternative is intended to meet the applicant's objectives (see DEIS page 2-8 for a list of these objectives).

Despite these similarities, certain redevelopment assumptions under the Preferred Alternative have been modified from those described in the DEIS. Based on those redevelopment assumptions, the following environmental analyses in the DEIS largely would not change.

- Farth
- Environmental Health

- Land and Shoreline Use
- Energy Greenhouse Gas Emissions

As described above, many of the redevelopment assumptions would remain the same under the Preferred Alternative, and as a result, the environmental analysis associated with those assumptions would also remain the same. However, for those assumptions that have been modified under the Preferred Alternative, an updated analysis for the associated environmental elements is provided in this EIS Addendum, including the following:

- Critical Areas
- Aesthetics/Views
- Parks and Recreation

- Transportation
- Cultural Resources
- Relationship to Plans and Policies

#### 1.2 PREFERRED ALTERNATIVE

Based on information provided in the DEIS, as well as comments from EPA, and input and continued coordination with the City of Renton, the applicant has voluntarily developed a Preferred Alternative for analysis in this EIS Addendum.

Many aspects of the Preferred Alternative would be similar to Alternative 2 in the DEIS, including the following areas:

- Retail/Restaurant Uses (21,600 sq. ft. retail/9,000 sq. ft. restaurant)
- Office Uses (none)
- Residential Units (692 units)
- Maximum Building Heights (64 ft.)
- Anticipated Site Population (1,108 residents)
- Anticipated Site Employment (50 employees)
- Access/Parking (1,337 parking spaces)
- Landscape Design (shoreline restoration + native and ornamental plantings in the upland area)
- Grading (53,000–133,000 CY of fill)
- Utilities (sewer and water from City of Renton; stormwater per City of Renton Amendments to the 2009 KCSWDM)

The following redevelopment assumptions have been modified from those described in the DEIS under Alternatives 1 and 2, based on the comments from EPA, and input and continued coordination with the City of Renton:

- Shoreline Setback (100-ft. min. increased setback)
- Setbacks from Adjacent Properties (north: 38–95 ft.; south: 40–200 ft.)
- View Corridors (Street "B" corridor enlarged)
- Building Height Modulation (4-story buildings along south property line; 5- to 6-story buildings elsewhere)
- Open Space and Related Areas (10.6 acres)
- Building Design (more brick, stucco, masonry, and precast concrete, and less metal siding)
- Emergency Access Road (in the western portion of the site)

See Chapter 2 of this EIS Addendum for further details on the Preferred Alternative.

# 1.3 SUMMARY OF IMPACTS, MITIGATION MEASURES, AND SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

The following list summarizes the impacts, mitigation measures, and significant unavoidable adverse impacts that would potentially result from the Preferred Alternative analyzed in this EIS

Addendum. "Proposed" mitigation measures are those actions which the applicant has proposed at this point in time (and could become part of the Mitigation Agreement with the City) and/or are required by code, laws or local, state and federal regulations. "Possible" mitigation measures are actions that could be undertaken, but are not necessary to mitigate significant impacts, and are above and beyond those proposed by the applicant.

### **Earth**

#### Impacts

Redevelopment under the Preferred Alternative would result in potential earth-related impacts that would be similar to those analyzed in the DEIS, including impacts associated with construction (i.e. erosion/sedimentation and ground settlement associated with site clearing and grading, installation of utilities and construction of building foundations), disturbance of geologic hazards, and interception of groundwater. No additional earth-related impacts would be anticipated.

### Mitigation Measures

### Proposed Mitigation Measures

### **During Construction**

- A temporary erosion and sedimentation control plan (TESCP), including Best Management Practices (BMPs) for erosion and sedimentation control, would be implemented, per the City of Renton Amendments to the 2009 King County Surface Water Design Manual (KCSWDM) adopted by the City of Renton. This plan would include the following measures:
  - All temporary (and/or permanent) devices used to collect stormwater runoff would be directed into tightlined systems that would discharge to an approved stormwater facility.
  - Soils to be reused at the site during construction would be stockpiled or stored in such a manner to minimize erosion from the stock pile. Protective measures could include covering with plastic sheeting and the use of silt fences around pile perimeters.
  - During construction, silt fences or other methods, such as straw bales, would be
    placed along surface water runoff collection areas in proximity to Lake Washington
    and the adjacent wetlands to reduce the potential of sediment discharge into these
    waters. In addition, rock check dams would be established along roadways during
    construction.
  - Temporary sedimentation traps or detention facilities would be installed to provide erosion and sediment transport control during construction.
- A geotechnical engineer would review the grading and TESCP plans prior to final plan design to ensure that erosion and sediment transport hazards are addressed during and

following construction. As necessary, additional erosion mitigation measures could be required in response to specific design plans.

- Site preparation for roadways, utilities and structures, and the placement and compaction of structural fill would be based upon the recommendations of a geotechnical engineer.
- Temporary excavation dewatering would be conducted if groundwater is encountered during excavation and construction activities. Such dewatering activities would be conducted in a manner that would minimize potential impacts due to settlement.
- Structural fill would be placed to control the potential for settlement of adjacent areas; adjacent structures/areas would be monitored to verify that no significant settlement occurs.
- Deep foundation systems (such as piles or aggregate piers) would be installed and/or ground improvements would be made to minimize potential damage from soil settlement, consolidation, spreading and liquefaction.
- If deep foundation systems (such as piles or aggregate piers) are used to support structures, the following measures would be implemented:
  - Measures would be employed to ensure that the soil cap (should it be installed) would not be affected and that installation of the piles/piers would not mobilize contamination that would be contained by the cap. Such measures could include: installation of surface casing through the contaminated zone; installation of piles composed of impermeable materials (steel or cast-in-place concrete) using soil displacement methods; the use of pointed tip piles to prevent carry down of contamination; and, the use of ground improvement technologies, such as in-place densification or compaction grouting.
  - A pile vibration analysis and vibration monitoring would be conducted during pile installation in order to ensure that impacts due to vibration do not occur.
  - Suitable pile and pile hammer types would be matched to the subsurface conditions to achieve the required penetrations with minimal effort to reduce potential vibration. Potential pile types could include driven open-end steel pipe piles, driven closed-end steel pipe piles, or driven cast-in-place concrete piles. Potential hammer types could include percussion hammers or vibratory hammers.
  - Suitable hammer and pile cushion types would be used for the specific conditions to reduce potential noise. A typical hammer employs the use of a heavy impact hammer that is controlled by a lead, which is in turn supported by a crane.
  - Pile installation would occur during regulated construction hours.
- Fill soils would be properly placed and cuts would be used to reduce the potential for landslide impacts during (and after) construction.

 The appropriate management of contaminated soils that could be disturbed and groundwater that could be encountered during redevelopment of the site would be addressed through the cleanup/remediation process and by institutional control requirements overseen by EPA (see Section 3.3, Environmental Health in the DEIS, for details).

### **Following Construction**

- A permanent stormwater control system would be installed in accordance with the City of Renton Amendments to the 2009 KCSWDM adopted by City of Renton.
- Offshore outfall locations for stormwater discharge from the permanent stormwater control system would be equipped with energy dissipation structures or other devices to prevent erosion of the lake bottom.
- All buildings would be designed in accordance with the 2009 IBC (or the applicable design codes that are in effect at the time of construction) to address the potential for seismic impacts.
- The majority of the site would be covered with impervious surfaces following redevelopment. Permanent landscaping would be provided to reduce the potential for erosion and sedimentation with redevelopment.

### Other Possible Mitigation Measures

 Flexible utility connections could be employed to minimize the risk of damage to the lines due to differential settlement between structures and underground utilities.

### Significant Unavoidable Adverse Impacts

There would be a risk of ground motion impacts and landslides beneath Lake Washington adjacent to the site during a seismic event; however, such impacts would occur with or without the proposed redevelopment. There are no significant unavoidable earth-related impacts that cannot be mitigated.

#### **Critical Areas**

#### Impacts

Redevelopment under the Preferred Alternative would have a slightly smaller development footprint, but similar features to DEIS Alternatives 1 and 2 (particularly DEIS Alternative 2). This alternative would maintain a 100-foot minimum setback from the Lake Washington shoreline, as compared to the 50-foot minimum setback under DEIS Alternatives 1 and 2. As a result, The Preferred Alternative would be anticipated to have slightly less impacts on wetlands and wildlife habitat than DEIS Alternatives 1 and 2. As the restored habitat along the lakeshore develops over time, this area would provide slightly more potential screening of the wetland and lakeshore habitats from impacts from operation of the project, including lighting impacts, as compared to DEIS Alternatives 1 and 2. However, given the urban context of the area, impacts

from noise, lighting, and other disturbance would not likely be substantially different than under DEIS Alternatives 1 and 2.

### Mitigation Measures

### Proposed Mitigation Measures

### **During Construction**

 A TESCP, including BMPs for erosion and sedimentation control, would be implemented during construction, per the City of Renton Amendments to the 2009 King County KCSWDM adopted by the City of Renton (see Section 3.1, Earth in the DEIS, and Appendix D to the DEIS for details). Implementation of this plan would prevent or limit impacts to the lake and shoreline wetlands from erosion and sedimentation.

### **Following Construction**

- Proposed redevelopment would avoid direct impacts to the retained/reestablished/expanded wetlands onsite.
- Re-established/expanded wetlands would be retained in an open space tract that includes required buffers and a riparian habitat enhancement area.
- Proposed buildings would be setback a minimum of 100 feet from the ordinary high water mark (OHWM), consistent with the City of Renton's 2011 Shoreline Master Program. The shoreline area would accommodate future wetlands, as well as buffers and setbacks. Final, detailed plans for the re-establishment of wetlands and their buffers onsite will be developed in coordination with EPA prior to redevelopment
- A permanent stormwater control system would be installed consistent with the requirements of the City of Renton Amendments to the 2009 KCSWDM adopted by the City of Renton. The system would collect and convey stormwater runoff to Lake Washington via a tight-lined system. Water quality treatment would be provided for runoff from pollution-generating surfaces to prevent water quality impacts to the lake and shoreline wetlands.
- Native plant species would be included within landscaping of the redeveloped upland area on the Main Property to the extent feasible, and could provide some limited habitat benefits to native wildlife species.
- Introduction of noxious weeds or invasive species would be avoided to the extent
  practicable in areas re-vegetated as part of the proposed redevelopment. Together with
  the native species planted, this would help limit the unnecessary spread of invasive
  species that could adversely affect the suitability of open space habitats on site and in
  the vicinity for wildlife.
- A publicly accessible, unpaved trail is proposed through the shoreline area that would include interpretive wetland viewpoints.

The proposed redevelopment would include design elements to minimize the potential
adverse affects of artificial lighting on wetland and riparian habitats. These include
directing lighting downward and away from these habitats or adjacent properties, and
could include shielding of lights, use of low-pressure sodium lights, or minimizing the use
of reflective glazing materials in building design, as feasible.

### Other Possible Mitigation Measures

- Trenching for utilities and stormwater outfalls could be incorporated into site grading associated with remediation efforts to limit or prevent later disturbance of re-vegetated areas.
- Upland areas on the Main Property could be temporarily re-vegetated following site remediation, depending on the timing of redevelopment.

### Significant Unavoidable Adverse Impacts

There are no significant unavoidable adverse impacts to critical areas that cannot be mitigated.

#### **Environmental Health**

#### **Impacts**

Redevelopment under the Preferred Alternative would result in potential environmental health-related impacts that would be similar to those under DEIS Alternatives 1 and 2, including potential impacts associated with exposure to contaminated soils during project construction, as well as exposure to potential vapors from volatile contaminants in the subsurface during project operation. No additional environmental health-related impacts would be expected.

### **Mitigation Measures**

### Proposed Mitigation Measures

- Redevelopment of the site is being coordinated with the cleanup/remediation process, and would be conducted consistent with the requirements in the final cleanup remedy selected and overseen by EPA, and with any associated institutional controls.
- The appropriate management of contaminated soils that could be disturbed and groundwater that could be encountered during redevelopment of the site would be addressed through the cleanup/remediation process and by institutional control requirements overseen by EPA. As necessary, lightweight fill materials, special capping requirements, vapor barriers and other measures would be implemented to ensure that unacceptable exposures to contaminated soils, groundwater, or vapors would not occur.
- Institutional controls would be followed to prevent the alteration of the soil cap without EPA approval, and to prevent the use of on-site groundwater for any purpose.

- An Operations, Maintenance, and Monitoring Plan would be implemented to prevent the
  excavation of soils, installation of utilities, or other site disturbances without prior EPA
  approval.
- As necessary, personal protection equipment for workers would be used and special handling and disposal measures followed during construction activities to prevent contact with hazardous materials and substances.
- Living/working areas on the Main Property would be separated from soil/groundwater contaminants by under-building garages; institutional controls would also be implemented to prevent exposure to unacceptable vapors.

### Other Possible Mitigation Measures

- Planned utilities (including the main utility corridors) could be installed as part of the planned remedial action so that disturbance of the soil cap and underlying contaminated soils/groundwater would not be necessary subsequent to capping of the Main Property.
- Personal protection measures and special training should be provided for City of Renton staff that provides inspection during construction and maintenance following construction in areas of the site that could generate contaminated soils or groundwater.
- Buried utilities and public roads serving the site development could be placed in clean fill
  material (with the utilities in a trench with sufficient width and depth of 3 to 4 feet below
  the invert of the utility), along with an acceptable barrier to prevent recontamination of
  the clean fill material, in order to protect the utility from contamination and to allow future
  maintenance of the road or utility lines.

### Significant Unavoidable Adverse Impacts

There are no significant unavoidable adverse environmental health-related impacts that cannot be mitigated.

### **Energy - Greenhouse Gas Emissions**

### **Impacts**

Redevelopment under the Preferred Alternative would result in potential energy and greenhouse gas (GHG)-related impacts that would be similar to or less than those under DEIS Alternatives 1 and 2. No further energy/GHG-related impacts would be anticipated.

### Mitigation Measures

### Other Possible Mitigation Measures

 Development could incorporate low-impact/sustainable design features into the design of proposed buildings on the site to reduce the demand for energy and reduce the amount of GHG emissions. Such features have not been identified at this time, but could include architectural design features; sustainable building materials; use of energy efficient

# **EXECUTIVE SUMMARY**

### **ES.1** Introduction

A Remedial Investigation (RI) and Feasibility Study (FS) for the Quendall Terminals Site ("the Site", also referred to as "the Quendall Site") are being conducted by the Quendall Terminals owners (Altino Properties, Inc., and J.H. Baxter & Company; the Respondents) under the direction of the United States Environmental Protection Agency (EPA). The Quendall Site is a former creosote manufacturing facility that was added to the National Priorities List in 2006. The resulting Quendall Administrative Settlement Agreement and Order on Consent, as amended (referred to as "the AOC") was approved pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, under which the work is being conducted.

This RI Report contains background information and describes the RI field investigation conducted in 2009 at the Quendall Site consistent with the EPA-approved Data Collection Work Plan (Anchor QEA and Aspect 2009a). The findings presented in this RI Report are based on historical and RI investigations of hazardous substances in the upland soil, off-shore sediment (including sediment porewater), surface water, and groundwater at the Quendall Site, and were used to develop a conceptual site model (CSM) for the Site. The CSM describes the relationship between Site historical operations and contaminant sources, the nature and extent of dense non-aqueous phase liquid (DNAPL) and the nature and extent of DNAPL contamination in Site media, contaminant fate and transport processes, and chemicals of concern (COCs) that have the potential to pose unacceptable risks to human health and the environment.

The sections that follow briefly describe the major topics addressed in each main section of the RI, focusing on those aspects that will affect future cleanup activities at the Site:

- Section ES.2 Site History and Environmental Data
- Section ES.3 Environmental Setting
- Section ES.4 Nature and Extent of DNAPL

<sup>&</sup>lt;sup>1</sup> Preliminary fieldwork for the 2009 RI field investigation was performed in 2008.

- Section ES.5 Nature and Extent of Contamination in Site Media
- Section ES.6 Contaminant Fate and Transport
- Section ES.7 Baseline Risk Assessment
- Section ES.8 Conclusions and Recommendations

Section ES.9 lists the references cited in this Executive Summary. Figures and tables are provided following Section ES.9.

### **ES.2** Site History and Environmental Data

The Quendall Site (Figure ES-1) is located on Lake Washington in the northernmost limits of the City of Renton, within a former industrial area that now includes residential and commercial uses. The physical address is 4503 Lake Washington Boulevard North. In addition to the portion of the Site owned by Quendall Terminals (referred to as the Quendall property), the Site also includes the Burlington Northern Railroad right-of-way to the east (referred to as the Railroad property) and state-owned aquatic lands to the west.

The upland portion of the Site encompasses approximately 22 acres, is relatively flat, and occupies the middle portion of a roughly 70-acre alluvial plain that has been modified over the last 90 years by filling and grading. Shortly after the lowering of Lake Washington in 1916 to construct the Lake Washington Ship Canal, the Site, including newly exposed portions of the former May Creek delta, was developed into a creosote manufacturing facility. May Creek originally ran through the Site to Lake Washington until it was diverted to the south of the property prior to 1936. Creosote was manufactured on the Site until 1969. From 1969 to approximately 1983, some of the aboveground storage tanks at the Site were used intermittently for storage of crude oil, waste oil, and diesel fuel. From 1975 to 2009, the Site was used primarily for log sorting and storage. The Site is currently vacant and fenced.

The Quendall Site borders approximately 1,500 feet of Lake Washington shoreline. Access to the Site is from Lake Washington Boulevard North, located along the eastern boundary of the property. Shoreline properties immediately adjacent to the Site include Conner Homes to the south (the former Barbee Mill site) and Football Northwest to the north (a former J.H.

Baxter & Company property). Interstate 405 (I-405) is located approximately 500 feet to the east.

Portions of the aquatic lands adjacent to the facility are either owned privately or by the State of Washington.<sup>2</sup> The area of the lake adjacent to the property is also considered prime habitat for the rearing of juvenile salmonid stocks, including Chinook salmon, which are listed as threatened under the Endangered Species Act (ESA). The Site is located within the Usual and Accustomed (U&A) fishing grounds used by the Muckleshoot, Suquamish, and Tulalip Tribes. Recreational fishing (catch and release) also occurs offshore from the property.

Previous Site activities, including the operation of log sorting yards, have resulted in the accumulation of wood chips and bark materials in the central and eastern portions of the property. The exposed Site soil is relatively fine-grained, which slows infiltration during rainy periods thus causing ponding in many areas.

The following sections briefly discuss the historical releases of contaminants at the Quendall Site and a summary of the CSM for the Site.

# **Historical Releases of Contaminants**

Creosote manufacturing was conducted at the Site from 1916 through 1969. Coal and oil-gas tar residues (collectively referred to as coal tar) were distilled into several fractions that were shipped off-Site for a variety of uses. The light distillate fraction was typically used as feedstock in chemical manufacturing. The middle distillate fraction, creosote, was used in the wood preserving industry. The bottom fraction, pitch, was used for applications such as roofing tar. During this period, releases of coal tar and distillate products to the soil occurred at various locations in the uplands and in the offshore where product transport, production, storage, and/or disposal were performed. These releases have resulted in the presence of DNAPL in the subsurface uplands and in offshore sediment.

<sup>&</sup>lt;sup>2</sup> Aquatic lands adjacent to the facility managed by the Washington State Department of Natural Resources were historically leased for log rafting and vessel storage, but those leases were terminated in the 1990s.

Figure ES-2 shows the locations of historical Site features and sources of DNAPL contamination. Historical releases of DNAPL in the form of coal tar and distillate products occurred in five general Site areas, as follows:

- Former May Creek Channel Area The former May Creek Channel south of the
  manufacturing plant and nearby storage tanks received wastes from historical
  operations. Wastes from nearby tanks were reportedly placed in the eastern portion
  of the former channel, and the western portion of the channel received creosote
  wastes discharged from a former plant sewer outfall.
- Still House Area Around the former Still House, coal tar was distilled and creosote and light distillates were transferred to surrounding tanks via piping. A pipeline was present between the tanks west of the Still House and the property to the north of the Site (formerly occupied by J.H. Baxter & Company, which operated a wood-treatment plant from 1955 until 1982). This pipeline was used to transport creosote used in the wood-treatment process. Reported releases included product spills directly onto the soil floor of the Still House.
- Railroad Loading Area The Tank Car Loading Area at the railroad tracks east of the Still House was located on a trestle built over May Creek and was the location of reported spills. A platform for loading solid materials (e.g., tar, pitch) was also located farther north on the tracks.
- Quendall Pond/North Sump Area The north and south sumps received liquid wastes
  from the manufacturing process involving creosote and tars. Tank bottoms from
  nearby storage tanks were also reportedly placed west of the north sump, where
  Quendall Pond is now located. The south sump was reportedly filled in before 1950.
  Shortly after the plant was shut down, approximately 50 truckloads of material were
  excavated from the larger north sump and disposed of at the Coal Creek Landfill.
- T-Dock Area Offshore, along the former T-Dock, coal tar feedstock was offloaded and transferred to Site upland areas through a pipeline located on the deck of the dock. A large spill (reportedly 30,000 to 40,000 gallons of coal tar feedstock) occurred sometime between 1930 and 1940 at the western end of the T-Dock during barge offloading. Contamination in surface sediment along the former main stem of the T-Dock indicates that there may have been spills from leaks in the piping.

Some solid wastes produced in the manufacturing process were also disposed of at the Site. Heavy tar produced by the distillation process was cooled and solidified in pitch bays north of the Still House. Waste pitch, also called Saturday Coke, was chiseled out and reportedly placed near the Site shoreline. Solid tar products have also been observed in shallow soil around the northern railroad loading area, where solid products were loaded onto railcars.

After the creosote plant was closed in 1969, all structures except for six aboveground storage tanks (ASTs) and the office were demolished. Petroleum was stored at the Quendall Site using the remaining tanks for approximately 13 years, from 1969 to 1982. Reported spills during this period may also have impacted Site media, and while there were reported spills of petroleum product around the ASTs, investigations have not indicated the presence of free-phase light non-aqueous phase liquid (LNAPL) at the Site.

In 1972, Quendall Pond (Figure ES-1) was initially created to capture product originating at the north sump and inhibiting its migration to Lake Washington. In spite of this, contamination has migrated from Quendall Pond into the nearby groundwater, lake surface water, and nearshore sediment.

#### **Environmental Data**

The RI Report relies on environmental data from both historical and recent (2009 RI) field investigations. A quality assurance (QA) screening was conducted for historical environmental datasets and appropriate data quality designations (QA2, QA1, or QA0) were assigned to each dataset, as follows:

- QA2 quality data are usable for all RI/FS purposes, including assessing boundaries of contamination at the Site and performing risk assessment exposure calculations.
- QA1 quality data are usable for evaluating the nature and extent of contamination, and can be used with QA2 quality data to assist in assessing boundaries of contamination. QA1 quality data are not as desirable as QA2 data for performing risk assessment exposure calculations, but may be used in cases where QA2 quality data are not available.
- QA0 quality data have too much uncertainty associated with them because of age, analytical method, or lack of complete laboratory documentation, and are not

considered usable for assessing boundaries of contamination or performing risk assessment exposure calculations. These data may be used in conjunction with higher-quality data and/or other lines of evidence to assist in identifying contaminants of interest (COIs), refining assessments of the nature and extent of contamination, and qualitatively evaluating historical trends in contaminant occurrences.

All environmental data generated during the recent 2009 RI field investigation were designated as category QA2 (i.e., the highest quality). These and other historical QA2 quality data were used as the primary line of evidence for delineating the approximate spatial boundaries of Site contamination and for conducting a baseline risk assessment. However, QA1 historical data were considered to support both contamination boundary delineation and the baseline risk assessment in specific circumstances.

During the work planning process, preliminary remediation goals (PRGs) were identified based on federal and state applicable or relevant and appropriate requirements (ARARs) and risk-based criteria. COIs were identified as those chemical constituents exceeding PRGs and associated with products or materials that have been historically used or manufactured at the Quendall Site or similar sites. Because a relatively large number of hazardous substances have been detected at the Site at concentrations above the most stringent PRGs, a subset of the Site COIs, referred to as "indicator chemicals", were used to more efficiently characterize the nature and extent of contamination and the related fate and transport characteristics of those chemicals. Two general categories of Site indicator chemicals were identified: 1) chemicals associated with coal tar products, and 2) chemicals associated with sources other than coal tar products (i.e., from other potential sources). The indicator chemicals in each category are as follows:

• Coal tar products: benzene and polynuclear aromatic hydrocarbons (PAHs) (acenaphthene, acenaphthylene, anthracene, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz(a,h)anthracene, indeno[1,2,3-c,d]pyrene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene).

• Other potential sources: arsenic, chromium (III),<sup>3</sup> copper, total polychlorinated biphenyls (PCBs), phenol, 4-methylphenol, pentachlorophenol (PCP), and total organic carbon (TOC).

Benzene and PAHs are associated with the DNAPL present at the Site as the result of the production of coal tar and creosote. Various risk-based metrics of PAH toxicity (carcinogenic PAHs [cPAHs], high-molecular-weight PAHs (HPAHs), low-molecular-weight PAHs [LPAHs], and PAH equilibrium partitioning sediment benchmark quotients [ESBQs] are used for the assessments in the RI Report. Arsenic is of interest because of its historical use at the former Barbee Mill site (now the Conner Homes Property, to the south of the Quendall Site), and PCP because of its potential association with the wood-treating activities at the former J.H. Baxter & Company Property (now Football Northwest, to the north of the Site). The other metals and PCBs are of interest because of the historical storage of waste oil at the Quendall Site. Phenol, 4-methylphenol, and TOC are included because they can be used to characterize the potential adverse effects of wood debris in the shallow sediment offshore from the Site. A list of all COIs and indicator chemicals is provided in Table ES-1.

The remainder of this Executive Summary describes the environmental setting at the Site, where indicator chemicals occur, in what form, and their current and possible future impacts to Site media and potential receptors. Conclusions drawn from the RI and recommendations for further action at the Quendall Site are presented in Section ES.8.

# **ES.3** Environmental Setting

The Quendall Site is located in the southeastern part of the Puget Sound Lowland. The geologic units beneath the Site consist of highly heterogeneous alluvial and lacustrine silts, sands, and peat underlain by a coarser sand-gravel alluvium. The groundwater flow system is characterized primarily by recharge in the upland areas east of the Site and the May Creek drainage south/southeast of the Site, with flow towards the west and discharge to Lake Washington. Site groundwater likely originates from precipitation on and east of the Site

<sup>&</sup>lt;sup>3</sup> Soil conditions at the Site are characterized by high organic carbon content, supporting a reducing environment and neutral pH. Because the oxidizing environment required to maintain chromium (VI) is not present at the Site, chromium (VI) was not retained as a COI.

and recharge from alluvial deposits in the May Creek drainage immediately south of the Site. The local geology and hydrology are significant factors affecting the migration patterns of contaminants throughout the Quendall Site.

# Site Geology

The shallow geologic units that affect the distribution of contaminants and are of importance to the future cleanup of the Quendall Site include the following:

- An upper Fill Unit ranging from 1 to more than 10 feet thick that occurs across the
  entire Site. The unit is heterogeneous but permeable, and consists of a mix of silt,
  sand, and gravel as well as wood debris, glass, brick, and pitch-like material.
- The Shallow Alluvium that occurs beneath the Fill Unit, ranging to depths between 30 and 50 feet below ground surface (bgs), and consists of interbedded and discontinuous layers of generally low-permeability, heterogeneous layers of sand, silt, and peat that dip to the west, consistent with their deltaic depositional origin. The sand layers provide preferential pathways for groundwater flow.
- The Deeper Alluvium that occurs beneath the Shallow Alluvium, and consists of more permeable, homogeneous sand and gravelly sand, with occasional lowerpermeability interbedded silt to silty sand layers. This unit extends to depths of between 90 and 140 feet bgs.

The presence of heterogeneous, interbedded, and discontinuous layers of lower-permeability materials complicates the fate and transport of both DNAPL and resulting dissolved-phase contaminants in groundwater. Evidence from field observations suggests that interbedded, low-permeability layers in the Shallow Alluvium create stratigraphic "traps" that can stop, slow, or alter migration of DNAPL.

# Site Groundwater Hydrology

The shallow hydrologic units that affect the distribution of contamination and are of importance to the future cleanup of the Quendall Site include the following:

 The Shallow Aquifer that occurs in the Fill Unit and in the Shallow Alluvium to depths of approximately 30 to 50 feet bgs, with the water table typically encountered

- at depths of 6 to 8 feet.
- The Deep Aquifer that occurs in the Deeper Alluvium (beneath the Shallow Alluvium) to a depth of approximately 140 feet bgs.

Site groundwater generally flows horizontally across the Site in an east to west direction, ultimately discharging to Lake Washington. Vertical hydraulic interaction between the Shallow and Deep Aquifers is limited by the horizontal stratification of the Shallow Alluvium. However, vertical groundwater movement varies depending on where the groundwater flowpaths originate. Shallow groundwater in the eastern portion of the Site near the Railroad Property typically flows downward through the Shallow Aquifer and reaches the upper portion of the Deep Aquifer. Within the central areas of the Site, groundwater flow is primarily horizontal and vertical exchange between the two aquifers is limited. Near the shoreline of Lake Washington, groundwater in the Deep Aquifer has an upward flow component, traveling through the Shallow Aquifer before discharging to surface water. Groundwater flow through the Shallow and Deep Aquifers has been defined by modeled groundwater flowpaths as illustrated in Figure ES-3.

While the discontinuous geological layers of silt, sandy silt, and peat provide varying degrees of hydraulic separation between the Shallow and Deep Aquifers, geological studies have not found a well-defined aquitard between the two aquifers. The presence of bedrock and fine-grained deposits limits the lateral extent of local aquifers encountered beneath the Site, isolating them from regional aquifers located to the south in the Cedar River valley.

# **Bathymetry and Sediment Characteristics**

The lake bottom offshore from the Site is relatively flat, with water depths up to 31 feet at the westernmost extent of the Quendall property boundary (the inner harbor line). The bottom substrate is typically a fine silt/mud, although several areas consist of sandier material, including the Quendall Site sand spit and sediment near the outer harbor line south of the former T-Dock.

### Natural Resources

The Site includes upland, riparian, wetland, and nearshore habitats. Upland vegetation consists primarily of early successional species and invasive species including large stands of Himalayan blackberry and Scot's broom. Because of the most recent log handling and storage uses in the uplands, there are large deposits of wood debris covering access roads and storage areas. Riparian vegetation is generally present across the Site shoreline, with the exception of the southern log handling area. Aquatic vegetation consists mostly of dense beds of Eurasian milfoil. Fish that may use the Site include Chinook salmon, steelhead, and bull trout, all of which are listed as threatened species under the ESA. Juveniles of all three species may use the nearshore for rearing; however, steelhead are more likely to remain in their natal streams until they migrate directly to Puget Sound.

Groundwater beneath the Site and Lake Washington are considered potable water supplies; however, neither is currently used as a source of drinking water. The valued habitats, ESA-listed species, and potable water supply designation are significant considerations for future cleanup activities.

### **ES.4** Nature and Extent of DNAPL

The distribution and varied characteristics of DNAPL at the Quendall Site have a significant effect on the nature and extent of contamination present in Site groundwater, soil, and sediment (described in Section ES.5). DNAPL at the Site was characterized based on the following descriptions:

- No visible evidence No visible evidence of oil on sample.
- Sheen Light to heavy and colorful film on sample (or as a result of a sheen test).
- Staining Visible brown or black staining on sample. Can be visible as mottling or in bands. Typically associated with fine-grained materials.
- Oil-coated Visible brown or black oil coating on sample grains. Typically associated with coarse-grained materials.
- Oil-wetted Visible brown or black oil wetting the sample grains. Oil appears as a liquid and is not held by the sample grains.

Soil and sediment that appeared oil-coated or oil-wetted were identified as containing DNAPL. Figure ES-4 shows a generalized CSM of the presence of DNAPL at the Site and how it affects other media. DNAPL that was spilled or disposed of on surface soil and sediment at the Quendall Site continues to serve as an ongoing source of contaminants to Site soil, groundwater, surface water, and sediment (and sediment porewater). The natural environment at the Quendall Site has significantly affected the current DNAPL architecture and the extent of DNAPL-related contamination. As indicated on the figure, DNAPL in the uplands at the Quendall Site is generally found in shallow stringers located in permeable soil, rather than in one or more continuous "pools". Of 57 borings where DNAPL was encountered, 44 had only one layer of DNAPL.

Figure ES-5 shows the extent of DNAPL observed both in the uplands and in sediment. The left panel shows the cumulative DNAPL thickness, and the right panel shows the maximum depths where DNAPL has been encountered.<sup>4</sup> DNAPL has been observed in the following five general Site areas, which are correlated to historical releases of creosote and coal tar products, geography, and particular facility operations:

- The Former May Creek Channel Area, which includes an area west of a former sewer outfall where wastes from the Still House were reportedly discharged, and an area south of former ASTs (Tanks 1 through 5) where tank bottoms were reportedly placed.
- The Still House Area where coal tar was refined into creosote.
- The Railroad Loading Area where creosote was loaded onto railcars, coal tar was offloaded from railcars, and spills reportedly occurred.
- The Quendall Pond/North Sump Area where coal tar and creosote manufacturing wastes, such contaminated condenser effluent, were reportedly discharged.
- The T-Dock Area where coal tar was offloaded from freighters, and spills reportedly occurred.

<sup>&</sup>lt;sup>4</sup> The nature and extent of DNAPL, or the potential for DNAPL presence, have been defined using field screening (observations from soil and sediment borings), measurement of DNAPL accumulation in wells, and soil and groundwater concentrations as indicators of the potential presence of DNAPL.

Table ES-2 presents the approximate acreage of soil and/or sediment containing DNAPL, the average cumulative thickness of layers of DNAPL, the maximum depth of DNAPL encountered during drilling, and the volume of impacted media (cubic yards) and DNAPL (gallons) for each of the five general areas of the Site where DNAPL has been found. It is estimated that approximately 445,000 gallons of DNAPL are present in the subsurface at the site, impacting a total of 9.7 acres of the Site.

The majority of DNAPL in the uplands is found within the top 20 feet of the Shallow Aquifer. The deepest that DNAPL is found in the uplands is in the Railroad Loading Area at 30 feet and in the Former May Creek Channel Area at 34 feet. Upland DNAPL is found only within the Shallow Aquifer with an exception of a thin layer of DNAPL within the top layer of the Deeper Aquifer in the Former May Creek Channel Area. The highest cumulative thicknesses of DNAPL are found within the Former May Creek Channel Area (8.8 feet) and the Railroad Loading Area (11 feet). The Quendall Pond/North Sump Area contains the most DNAPL in terms of volume and affected acreage.

Offshore occurrences of DNAPL are sporadic. The maximum depth of DNAPL observed in the T-Dock Area is 3.8 feet, although most of the DNAPL along the T-Dock occurs very near the surface, indicating that the DNAPL occurrences in sediment in this area are associated with leaks and spills from historical operations. DNAPL has also migrated from the uplands to nearshore sediment and has been found as deep as 16 feet immediately west of Quendall Pond.

### ES.5 Nature and Extent of Contamination in Site Media

The highest levels of contamination in Site environmental media are associated with occurrences of creosote and coal tar DNAPL. As noted above, DNAPL serves as an ongoing source of contaminants to Site soil, groundwater, and offshore sediment (including sediment porewater, and ultimately surface water). Because the nature and extent of Site groundwater contamination help inform the contaminant distribution in other Site media, the groundwater contamination at the Site is discussed first, followed by soil and sediment. The section closes with a discussion of solid tar products found in the Fill Unit at the Site.

# Nature and Extent of Groundwater Contamination

Coal-tar-product indicator chemicals (i.e., benzene and other PAHs) and arsenic are present in groundwater where DNAPL is present. Groundwater contamination at the Site has resulted from historical releases of aqueous wastes and from contaminant leaching/ dissolution from DNAPL and DNAPL-impacted soil present either above or below the water table. Site groundwater in the uplands is encountered at relatively shallow depths (typically 6 to 8 feet bgs). The approximate extents of groundwater contamination for benzene, naphthalene, cPAHs, and arsenic (based on comparison to PRG screening levels) are shown on Figure ES-6. The left panel shows Shallow Aquifer contamination; the right panel shows Deep Aquifer contamination.

The highest contaminant concentrations in groundwater have been detected in the Shallow Aquifer, and at the top of the Deep Aquifer, in and downgradient from DNAPL areas. Concentrations decrease with depth, and the vertical extent of benzene and naphthalene contamination in the deep groundwater interval is estimated to be less than 110 feet bgs near the shoreline. In contrast, cPAHs were not detected above PRG screening levels in the deep groundwater interval during the 2009 RI sampling events, which is not unexpected given that cPAHs are relatively insoluble and therefore less mobile in groundwater than the other indicator chemicals.

Arsenic concentrations exceeded both the PRG screening level (based on the maximum contaminant level [MCL]) of 10 micrograms per liter [ $\mu$ g/L]) and the state-wide background level of 5  $\mu$ g/L at most locations. Concentrations of arsenic in soil are considered to be consistent with background levels; therefore, elevated groundwater concentrations may result from the greater mobility of naturally occurring arsenic under reducing conditions, which occur in areas of peat, DNAPL, and dissolved-phase hydrocarbon contamination. The vertical extent of arsenic concentrations exceeding the PRG screening level is less than 85 feet.

Based on the available RI field investigation data, metals (with the exception of arsenic), PCP, and PCBs have not been detected in groundwater or have not been detected at concentrations above PRG screening levels.

# Nature and Extent of Soil Contamination

Site soil has been contaminated by historically-placed fill materials, historical DNAPL and/or aqueous waste releases, and as the result of DNAPL and contaminated groundwater migration. Potentially contaminated materials historically used as Site fill include heavy tar distillates such as pitch and Saturday Coke that are solid or semi-solid, and foundry slag. Because solid and semi-solid tar products are not mobile, their distribution is limited to the Site locations where they were placed. The vertical extent of Site solid and semi-solid tar products is limited to the shallow Fill Unit, which extends to 10 feet bgs. Solid and semi-solid tar products are typically only present above the water table, but may occur within areas that are seasonally saturated; however, because of their low leachability, these products are not significant contributors to groundwater contamination.

Benzene, naphthalene, and cPAHs have been detected in soil at high concentrations in the former May Creek Channel, near the Still House, near Quendall Pond, and in the Railroad Loading Area, and are strongly correlated with DNAPL or solid tar products. In areas of solid tar products, benzene concentrations are typically low or not detectable and cPAH concentrations are typically greater than naphthalene concentrations. Outside these areas, the extent of elevated benzene and/or naphthalene concentrations in soil corresponds to areas of groundwater contamination.

Benzene and naphthalene concentrations in surface soil (less than 5 feet bgs) are either low or not detectable, and are likely related to fill placement in 1983 after the creosote plant was shut down; however, concentrations of cPAHs significantly exceed the PRG screening levels in surface soil. In subsurface soil (5 feet bgs and deeper), the highest benzene, naphthalene, and cPAH concentrations are consistent with the presence of DNAPL or solid tar products, both vertically and laterally. The vertical extents of benzene and naphthalene in subsurface soil can also generally be delineated by their respective vertical extents in groundwater.

In contrast to coal-tar-product indicator chemicals, indicator chemicals related to metals, PCP, and PCBs have generally not been detected at the Quendall Site or, in the case of naturally occurring substances such as metals, have been detected at concentrations below PRG screening levels or close to natural background concentrations.

# Nature and Extent of Sediment Contamination

Surface and subsurface sediment contaminant sources at the Site include historical spills and leaks from ships, barges, and overwater conveyances, and ongoing contaminated groundwater inputs from upland sources. Two sediment areas impacted by hazardous substance releases are shown on Figure ES-7:

- Nearshore Groundwater Discharge Area: Located adjacent to Quendall Pond, this
  area currently receives contaminated groundwater loading from upland sources; this
  area was also the location of historical spills and leaks that discharged directly to
  surface water.
- T-Dock Spill Area: This area in the vicinity of the former T-Dock received historical releases of coal tar and fuel oil products directly to surface water and sediment from leaks and spills.

The primary indicator chemicals for sediments in these areas are PAHs, specifically naphthalene, cPAHs, and PAH ESBQs. The same indicator chemicals found in Site sediment were also found in sediment porewater. These indicator chemicals are also associated with coal tar product leaks and spills along the T-Dock, and transport of soluble DNAPL constituents in groundwater to the Nearshore Groundwater Discharge Area. Samples from both areas exceeded the PRG screening levels for naphthalene, cPAHs, and PAH ESBQs; however, benzene was not detected above the PRG screening level. Naphthalene concentrations in sediment porewater were highest directly offshore from Quendall Pond in the Nearshore Groundwater Discharge Area, which is consistent with the surface bulk sediment results as well as with naphthalene concentrations in shallow groundwater. cPAHs and PAH ESBQs in surface sediment were highest in the vicinity of the former T-Dock cross span. Bioassay data were collected to corroborate chemical data in surface sediment related to coal tar and fuel oil products. These results were evaluated as part of the baseline ecological risk assessment (summarized in Section ES.7).

# **ES.6** Contaminant Fate and Transport

Contaminants present in environmental media at the Quendall Site can migrate from one location to another via bulk flow (advection) or chemical gradient (diffusion) processes. Contaminants can also be transferred among air, water, and soil media via various partitioning mechanisms (e.g., volatilization, dissolution, and sorption) during migration, thereby modifying the rate of movement through the subsurface. In addition, contaminant concentrations can be reduced or attenuated by various combinations of chemical processes (e.g., diffusion and abiotic transformation), biological processes (e.g., biodegradation), or physical processes (e.g., dispersion and dilution), as well as by the partitioning mechanisms listed above. These contaminant transport, partitioning, and attenuation processes affect how the nature and extent of contamination may change over time, and provide a basis for assessing the potential effectiveness of technologies and remedial alternatives in the FS. Figure ES-8 shows a generalized CSM illustrating contaminant fate and transport processes operating at the Site.

### **DNAPL Movement and Dissolution**

As noted above, DNAPL is present in an estimated 9.7 acres of the Site. Most DNAPL is located below the water table and in constant contact with groundwater, and leaching of contaminants from the DNAPL occurs at a fairly steady rate.

DNAPL moves through the subsurface soil from its original source areas based on its Site-specific mobility. Mobility characteristics vary based on variations in local geology, soil architecture, and product characteristics. The Shallow Alluvium at the Site dips towards Lake Washington and consists of numerous permeable, discrete, thin sand or silty sand layers separated by low-permeability silt or peat. Because the density and viscosity of DNAPL are greater than those of water, DNAPL will migrate vertically until it becomes trapped by low-permeability materials. At that point, DNAPL will tend to: 1) accumulate on top of the lower-permeability layers and 2) migrate laterally through seams of higher permeability until becoming trapped by other intersecting lower-permeability layers. As DNAPL migrates through soil, it leaves behind a residual coating of product on the soil grains (referred to as "residual DNAPL" or "oil-coated" soil), diminishing the available volume of mobile DNAPL. DNAPL mobility in sediment is affected by the same parameters as mobility in soil.

However, additional parameters affect the mobility of DNAPL released to surface water (e.g., Lake Washington). In these cases, DNAPL mobility as a result of spilled or leaked material is a function of the location and volume of the spill event, the nature of the material, and physical conditions including weather and currents.

# Contaminant Transfer from DNAPL to Other Site Media

In evaluating the fate and transport of DNAPL, three pathways are of particular importance when evaluating potential contaminant exposures under current and future conditions:

- The DNAPL/soil/groundwater to air pathway
- The DNAPL/soil to groundwater to sediment/porewater pathway
- The groundwater to lake pathway

For the DNAPL to air and DNAPL to porewater pathways, computer model simulations that incorporated the transport, partitioning, and attenuation/transformation mechanisms described above were used to evaluate contaminant migration.

# DNAPL/Soil/Groundwater to Air Pathway

For the DNAPL/soil/groundwater to air pathway (also called the vapor intrusion pathway), contaminants present in the subsurface are transported via soil gas into the aboveground air. Contaminants present in DNAPL and soil in the unsaturated zone, and in groundwater at the top of the water table, volatilize into soil gas according to the partitioning relationships described above. Contaminant migration in soil vapor may be retarded by sorption onto soil, and contaminants may be removed by biodegradation. Indoor air modeling conducted in support of the Draft Task 3 Report (Anchor and Aspect 2007) indicated that exceedances of air PRGs for benzene and naphthalene are possible in future structures under baseline (unremediated) conditions. This finding was corroborated by the baseline human health risk assessment.

Based on the widespread occurrence of volatile contaminants in shallow Site soil and groundwater, and the results of a screening-level evaluation performed by EPA, it is anticipated that the design of future Site structures will need to include an evaluation of

vapor intrusion and will likely require that some form of vapor intrusion mitigation, either passive or active, is incorporated into the design.

### DNAPL/Soil to Groundwater to Sediment/Porewater Pathway

For this pathway, contaminants present in Site DNAPL or soil dissolve into groundwater and are transported in groundwater toward Lake Washington, where they are either discharged to the lake (discussed below) or, prior to discharge, are transformed or sorbed onto sediment.

At the Quendall Site, multiple DNAPL sources impact the Shallow Alluvium and Shallow Aquifer, such that dissolved contaminants are present at shallow depths in most of the Site. Dissolved contaminants enter the Deep Aquifer through the Shallow Aquifer in response to downward vertical gradients and dispersion (especially in the eastern portion of the Site). Once contaminants enter the Deep Aquifer they continue to migrate to depth in the Deep Aquifer through the dispersion process, as documented by Site monitoring data and computer modeling results.

To the west, upward groundwater gradients in the Nearshore Groundwater Discharge Area result in significant contaminant concentrations in surface and subsurface bulk sediment and in sediment porewater in that area. Contaminant transport modeling that was used to approximate the mixing and attenuation processes showed that undifferentiated abiotic and biodegradation may be important processes affecting the concentrations of the mobile indicator chemicals such as benzene and naphthalene, particularly in the Nearshore Groundwater Discharge Area. However, these degradation processes are not expected to have any appreciable effect on the concentrations of less mobile indicator chemicals such as cPAHs and arsenic.

### Groundwater to Lake Pathway

Contaminant fate and transport mechanisms that affect the groundwater to lake pathway are more numerous and variable, and thus are more complex than the mechanisms that affect the previous pathways. Detailed sampling and analysis of groundwater and sediment porewater concentration gradients were performed for the upper 4 feet of sediment in the Nearshore Groundwater Discharge Area of the Site. In addition to porewater analysis for

benzene and naphthalene, the sediment porewater samples were also analyzed for several relatively non-reactive "tracer" cations (sodium, potassium, calcium, and magnesium) to help differentiate between chemical/biological concentration attenuation processes that affect Site COIs and simple dilution with surface water. The results of the evaluation of these data showed significant attenuation (more than two to three orders of magnitude) of benzene and naphthalene as compared to the tracer cations, indicating the existence of biodegradation and/or chemical attenuation processes in the transition zone between groundwater and Lake Washington.

It is important to note that conclusions regarding degradation at the Site are applicable to existing conditions and processes. To the extent that future fate and transport characteristics of the Site are altered from existing conditions (e.g., following the implementation of remedial actions), these may lead to changes in fate and transport mechanisms and/or rates. Evaluation of future attenuation characteristics is included in the detailed evaluation of alternatives in the FS.

# **ES.7** Baseline Risk Assessment

Baseline human health and ecological risk assessments were conducted in accordance with EPA guidance using data of sufficient quality that have been collected from the Site.

The baseline human health risk assessment evaluated the following exposure scenarios:

- Future Residential Exposure Scenario. The residential scenario was based on
  potential redevelopment of the Site for residential purposes and future Site use by
  adults and children. The potential routes of exposure to contaminants in soil (to a
  depth of 15 feet bgs) and groundwater include incidental ingestion, dermal
  contact, and inhalation of fugitive dusts and vapors. Inhalation of vapors
  migrating from groundwater into future residential buildings is also possible.
- Future Occupational Worker Exposure Scenario. Adult workers could potentially
  be exposed to chemicals in soil (from 0 to 15 feet bgs) by incidental ingestion,
  dermal contact, and inhalation of ambient dust and vapors. Vapor intrusion into
  future non-residential buildings and exposure to groundwater by occupational

- workers are also possible; however, these pathways are addressed under the more health-conservative residential exposure scenario.
- Future Construction/Excavation Worker Exposure Scenario. Adult construction/
  excavation workers could potentially be exposed to chemicals in soil (from 0 to 15
  feet bgs) by incidental soil ingestion, dermal contact with soil, and inhalation of
  ambient dusts and vapors generated during excavation activities. Potential routes
  of exposure to shallow groundwater for the construction/excavation worker
  include dermal contact and inhalation of ambient vapors generated during
  excavation activities.
- Current and Future Recreational Beach User Exposure Scenario. The recreational beach user scenario addresses individuals engaged in recreation at the shoreline, gaining access either from Site uplands or via boat. Potential routes of exposure to nearshore surface sediment (0 to 4 inches bgs) and surface water include incidental ingestion and dermal contact.
- Current and Future Recreational Fishing Exposure Scenario. The recreational
  fishing exposure scenario addresses adult recreational anglers gaining Site access
  by boat or land and harvesting fish or shellfish for personal consumption using
  hook and line, traps, digging, or other methods. Potential exposure routes include
  ingestion of contaminants that bioaccumulate in fish/shellfish tissue, and
  incidental ingestion of and dermal contact with sediment during angling activities.
- Current and Future Subsistence Fishing Exposure Scenario. Lake Washington is a
  U&A fishing ground for the Muckleshoot, Suquamish, and Tulalip Tribes.
  Potential exposure routes under this scenario include ingestion of contaminants
  that bioaccumulate in fish/shellfish tissue, and incidental ingestion of and dermal
  contact with sediment during angling activities.

Figure ES-9 shows a generalized CSM illustrating exposure pathways relevant to human receptors at the Site.

EPA default exposure assumptions were used to evaluate these scenarios, including the subsistence fishing scenario. As discussed in the Human Health and Ecological Risk Assessment (HERA) Work Plan (Anchor QEA and Aspect 2009b), if no risk is indicated from subsistence fishing using this default ingestion rate, regional Tribal consumption rates (which

may be greater than the default subsistence rates) may need to be evaluated to see that Tribal and subsistence anglers are adequately protected.

The baseline human health risk assessment evaluated potential noncancer and cancer effects. For noncancer effects, the likelihood that a receptor will develop an adverse effect is estimated by comparing the predicted level of exposure for a particular chemical with the highest level of exposure that is considered protective. The ratio is termed the hazard quotient (HQ). When the HQ for a chemical exceeds 1, there is a concern that noncancer health effects are possible. To assess the potential for noncancer effects posed by exposure to multiple chemicals, a hazard index (HI) approach is used in accordance with EPA guidance (1989).

The potential for cancer effects is evaluated by estimating excess lifetime cancer risk (ELCR). This risk is the incremental increase in the probability of developing cancer during one's lifetime in addition to the background probability of developing cancer (i.e., if no exposure to Site chemicals occurs).<sup>5</sup> In interpreting estimates of excess lifetime cancer risks, EPA under the Superfund program generally considers action to be warranted when the multichemical aggregate cancer risk for all exposure routes within a specific exposure scenario exceeds 1 x 10<sup>-4</sup>. Action generally is not required for risks between 1 x 10<sup>-6</sup> and 1 x 10<sup>-4</sup>; however, this is judged on a case-by-case basis.

The results of the baseline HHRA are summarized in Table ES-3. As indicated in the table, the results of the human health risk characterization indicate that non-cancer HIs exceed 1 for all but the recreational beach user and recreational fishing scenarios. HIs exceeding 1 range from 3 (subsistence fish ingestion) to 7,995 (groundwater exposure for the future resident). ELCR estimates exceed 1 x  $10^{-4}$  for all six scenarios using Site data, ranging from 2 x  $10^{-4}$  (recreational fish ingestion) to greater than 8 x  $10^{-1}$  (groundwater exposure for the future resident). The residential indoor air pathway is also of concern. The ELCR estimate for this pathway is  $2 \times 10^{-2}$ , with the primary risk contributors being benzene, naphthalene, and ethylbenzene.

<sup>&</sup>lt;sup>5</sup> For example, an ELCR of 2 x 10<sup>-6</sup> means that for every 1 million people exposed to a carcinogen throughout their lifetimes, the average incidence of cancer may increase by two cases of cancer.

For the beach user and fishing scenarios, risk estimates were also developed using sediment samples from background locations in order to understand the contribution of background concentrations to Site risks and provide information that may be used for risk management decisions. When using the background sediment dataset, HIs are less than 1 for all three scenarios, and ELCR estimates for recreational and subsistence fish ingestion exceed  $1 \times 10^{-6}$  but are less than  $1 \times 10^{-4}$ .

Ecological receptors potentially include the animals and plants that use terrestrial and/or aquatic habitats within the Site. These ecological receptors can generally be segregated into plants, invertebrates, reptiles and amphibians, fish and shellfish, and mammals and birds. Representative species from groups including plants, invertebrates, fish, shellfish, birds, and mammals were selected as receptors of concern and further evaluated in a baseline ecological risk assessment to assess if and to what degree they may be at risk from contaminated media at the Site.

Ecological HQs were estimated using multiple lines of evidence; these included comparison of bulk soil (for soil invertebrates and terrestrial plants) and surface water/porewater concentrations (for fish and aquatic plants) to screening levels, and a multi-media exposure model approach that compared estimated total dietary intakes (TDIs) with literature toxicity reference values (TRVs) for both terrestrial and aquatic-dependent wildlife. Benthic invertebrate risk was assessed directly through sediment bioassays and by using the ESBQ approach for PAHs (EPA 2003).

The results of the ecological risk assessment indicate that risks for both terrestrial and aquatic-dependent wildlife receptors exceed an HQ of 1. The primary risk drivers are PAHs in soil, sediment, and sediment porewater. Site sediment that poses a PAH-related risk to benthic macroinvertebrates has been delineated in the Nearshore Groundwater Discharge Area (adjacent to Quendall Pond) and the T-Dock Spill Area. Benthic toxicity measured in sediment bioassays correlates closely with porewater PAH concentrations and is corroborated by PAH ESBQs that exceed 1.

If a cumulative ELCR of 1 x 10<sup>-4</sup> was exceeded for a given medium, the individual constituents that pose an ELCR of 1 x 10<sup>-6</sup> were identified as COCs for human health. Constituents that exceeded an HQ of 1 for either human or ecological receptors were also identified as COCs. Table ES-4 provides a list of the COCs by medium. The primary COCs that pose risks to human health throughout the Site are cPAHs, naphthalene, benzene, and arsenic. The primary COCs that pose risks to ecological receptors throughout the Site are PAHs, represented as both individual chemicals and as totals (LPAHs, HPAHs, total PAHs, and PAH ESBQs).

### ES.8 Conclusions and Recommendations

A total of 445,000 gallons of creosote and coal tar DNAPL is estimated to be present in the subsurface at the Quendall Site, covering approximately 9.7 acres of the Site (including offshore portions of the Site beneath Lake Washington), and typically observed in the upper 20 feet bgs. Coal tar and creosote product indicator chemicals (i.e., benzene, naphthalene, and cPAHs) and arsenic are present above PRGs in groundwater where DNAPL is present, with impacted groundwater generally extending downgradient (both horizontally and vertically) from DNAPL-impacted areas. The migration of contaminated groundwater from DNAPL source areas represents a secondary source of contamination to soil and sediment; therefore, the horizontal and vertical extent of contamination in groundwater is a good indicator of the extent of impacts to these other media. The results of the baseline human health and ecological risk assessment indicate that risks posed to humans and ecological receptors based on exposure to contaminated Site media exceed EPA's acceptable levels. The primary contributors to unacceptable risk are PAHs, naphthalene, benzene, and arsenic.

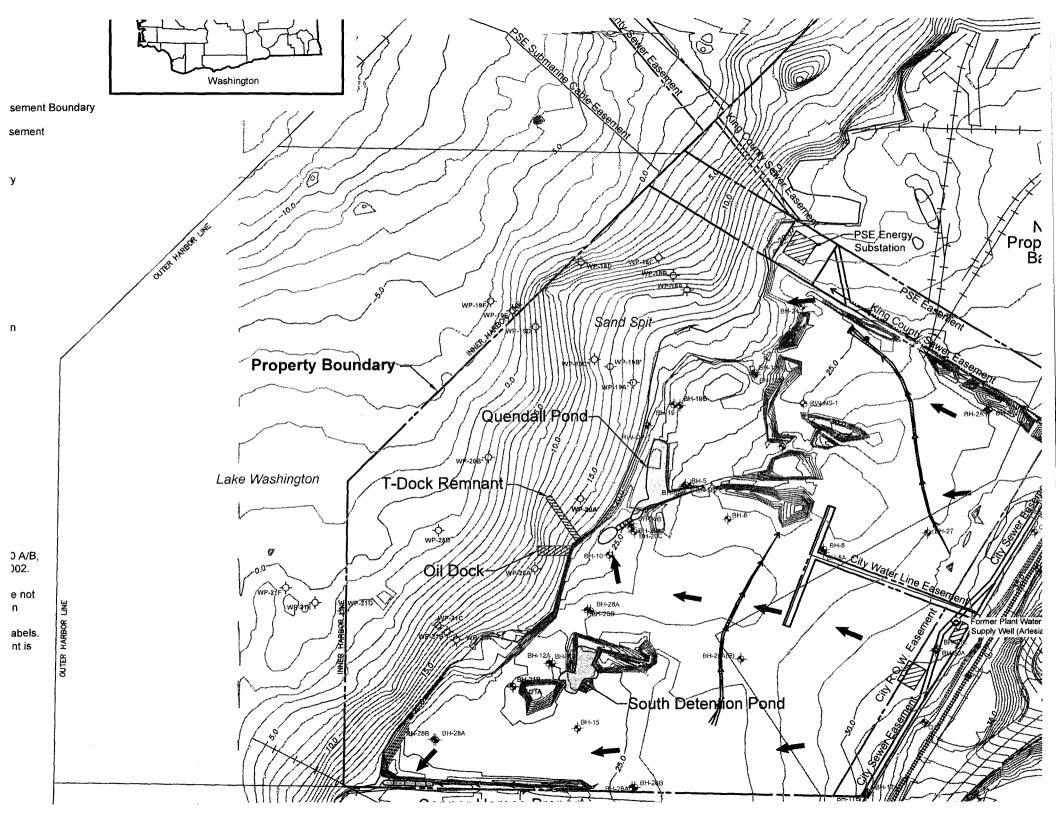
Based on these findings, it is recommended that:

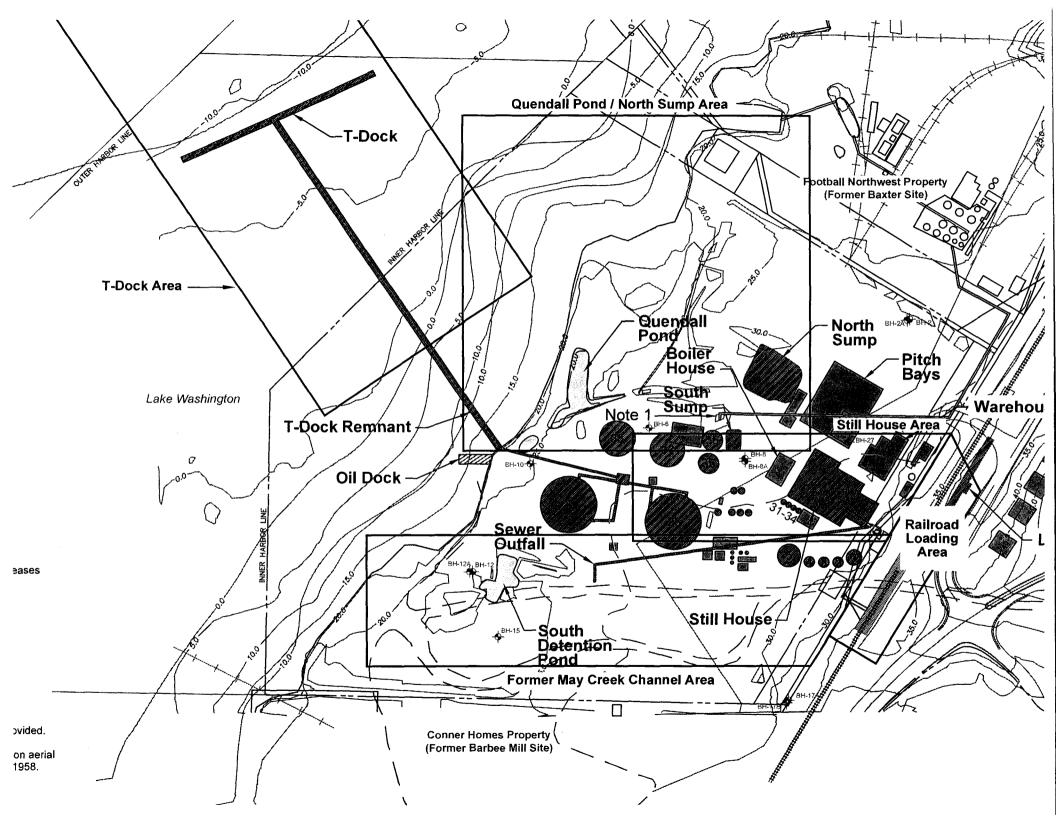
- Identification and evaluation of remedial alternatives that address DNAPL and other affected Site media with contaminants exceeding PRGs should be pursued in the FS.
- Groundwater flow and fate/transport modeling tools should continue to be updated as new groundwater monitoring data become available; the models should be enhanced in anticipation of their value in assessing candidate remedial alternatives developed during the FS.

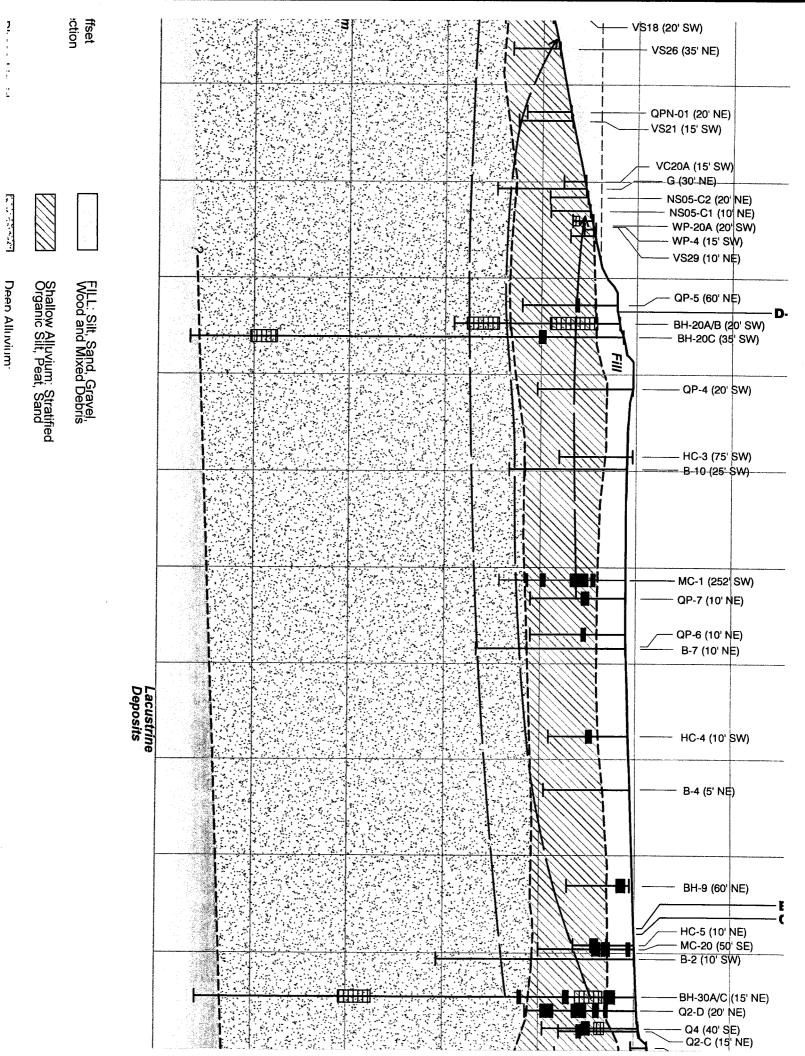
- Groundwater monitoring should continue to support ongoing analysis of groundwater quality trends and the horizontal and vertical migration of DNAPL over time.
- Until the selected remedy is fully functional, public access to the Site should be restricted by use of upland fencing, and signs prohibiting access to lake sediments and collection of shellfish for human consumption.

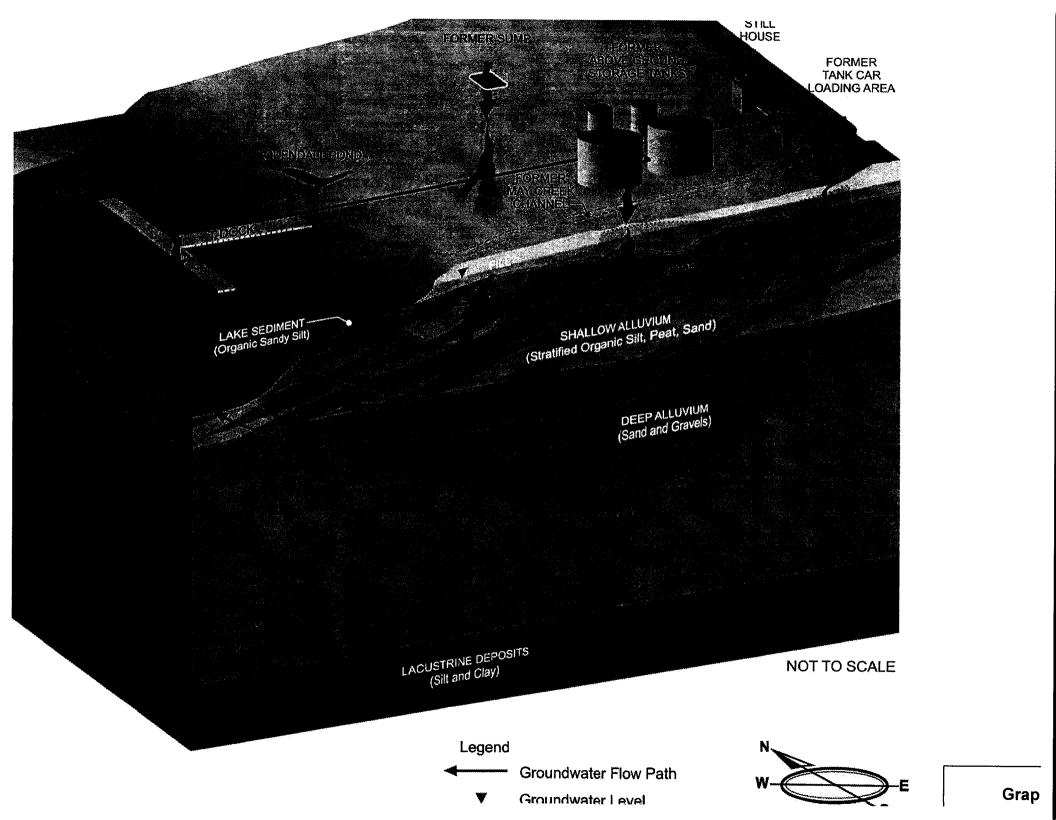
### ES.9 References

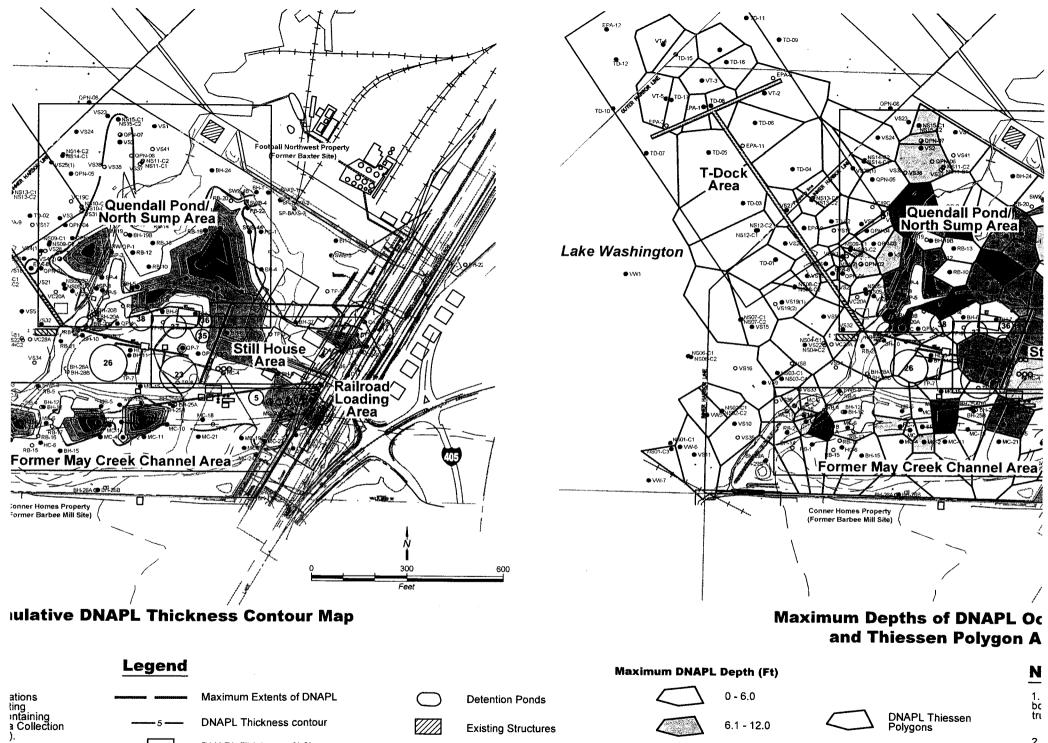
- Anchor and Aspect, 2007. Draft Task 3 Preliminary Conceptual Site Model, Remedial Action Objectives, Remediation Goals, and Data Gaps, Remedial Investigation/Feasibility Study, Quendall Terminals Site (Draft Task 3 Report). Report prepared for U.S. Environmental Protection Agency, Region 10, on behalf of Altino Properties, Inc., and J.H. Baxter & Company by Anchor Environmental, LLC, Seattle, WA and Aspect Consulting, LLC, Seattle, WA. November 2007.
- Anchor QEA and Aspect, 2009a. Final Data Collection Work Plan, Remedial Investigation/Feasibility Study, Quendall Terminals Site, Renton, Washington. Prepared for U.S. Environmental Protection Agency, Region 10, on behalf of Altino Properties, Inc., and J.H. Baxter & Company by Anchor QEA, LLC and Aspect Consulting, LLC. June 2009.
- Anchor QEA and Aspect, 2009b. Final Work Plan, Human Health and Ecological Risk Assessment, Quendall Terminals Site, Renton, Washington (HERA Work Plan). Prepared for U.S. Environmental Protection Agency, Region 10, on behalf of Altino Properties, Inc., and J. H. Baxter & Co. by Anchor QEA, LLC, and Aspect Consulting, LLC. November 2009.
- EPA (U.S. Environmental Protection Agency), 1989. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A), Interim Final. Office of Emergency and Remedial Response. EPA/540/1-89/002. December.
- EPA (U.S. Environmental Protection Agency), 2003. Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: P AH Mixtures. EPA/600/R-02/013. November 2003.











DNAPL Thickness contour

a Collection

DNAPL Thickness 0'-2'

DNAPL Thickness 0'-2'

Historical Structures

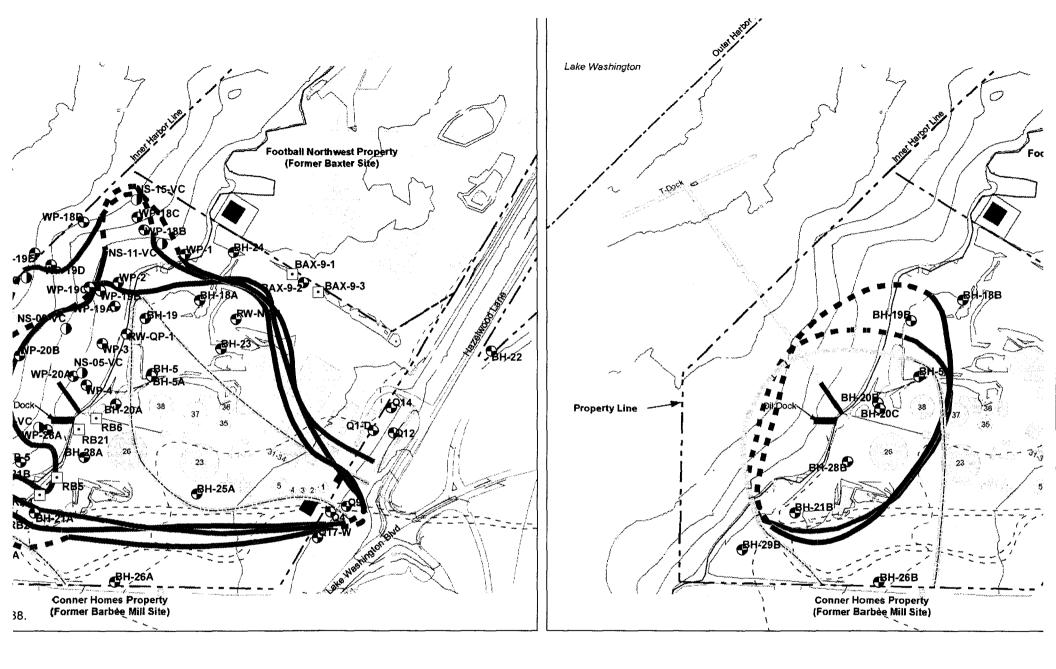
DNAPL Thickness 2'-4'

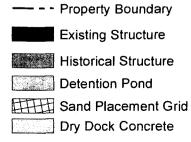
Other Historical Features

12.1 - 18.0

DNAPL Thickness 2'-4'

Other Historical Features





#### **Benzene Detected**

Above MCL (5 µg/L)

■ ■ Inferred from Lines of Evidence other than Groundwater

#### Naphthalene Detected

Above MTCA Method B Groundwater Cleanup Level (160 µg/L)

■ ■ Inferred from Lines of Evidence other than Groundwater Chemistry

### cPAHs (Benzo[a]Pyrene Equivalents) Detected

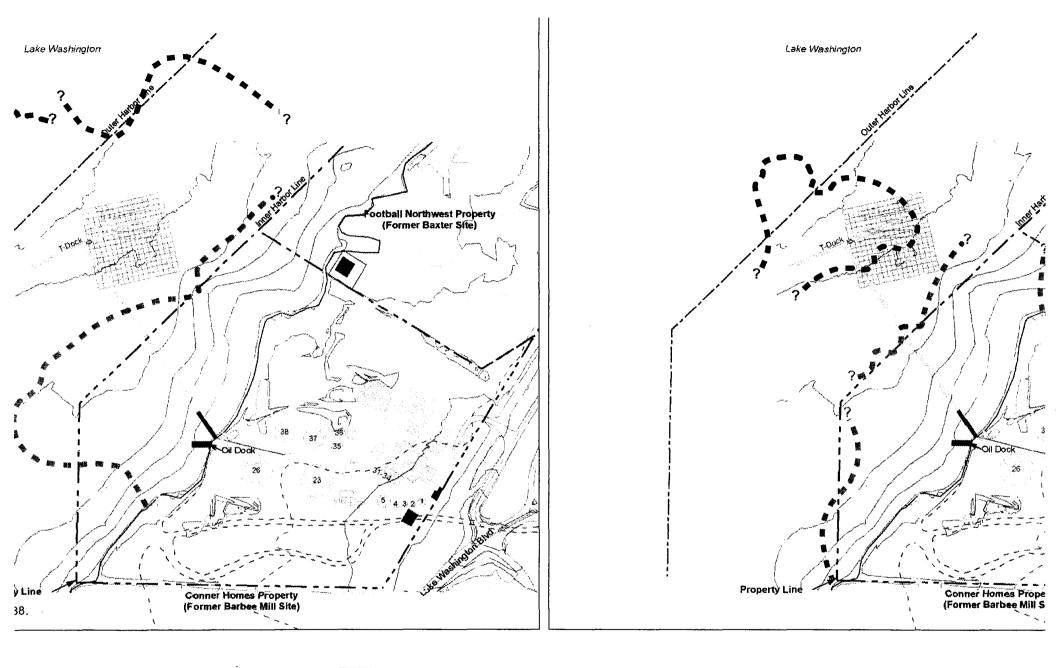
Above MCL (0.2 µg/L)

■ ■ Inferred from Lines of Evidence other than Grou

#### **Arsenic Detected**

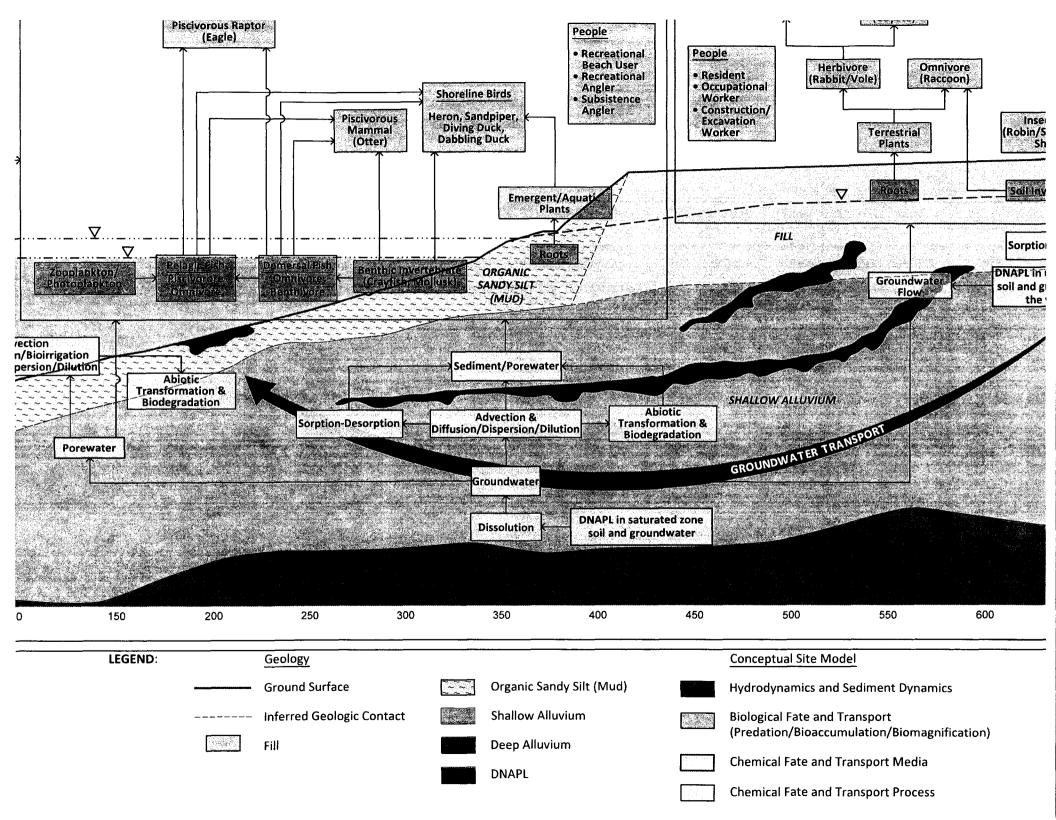
Above MCL (10 µg/L)

Inferred from Lines of Evidence other than Groun



aminant PRG Exceedance in T-Dock Spill Area aminant PRG Exceedance in Nearshore Area

Historical Structure
Detention Pond
Sand Placement Grid
Dry Dock Concrete



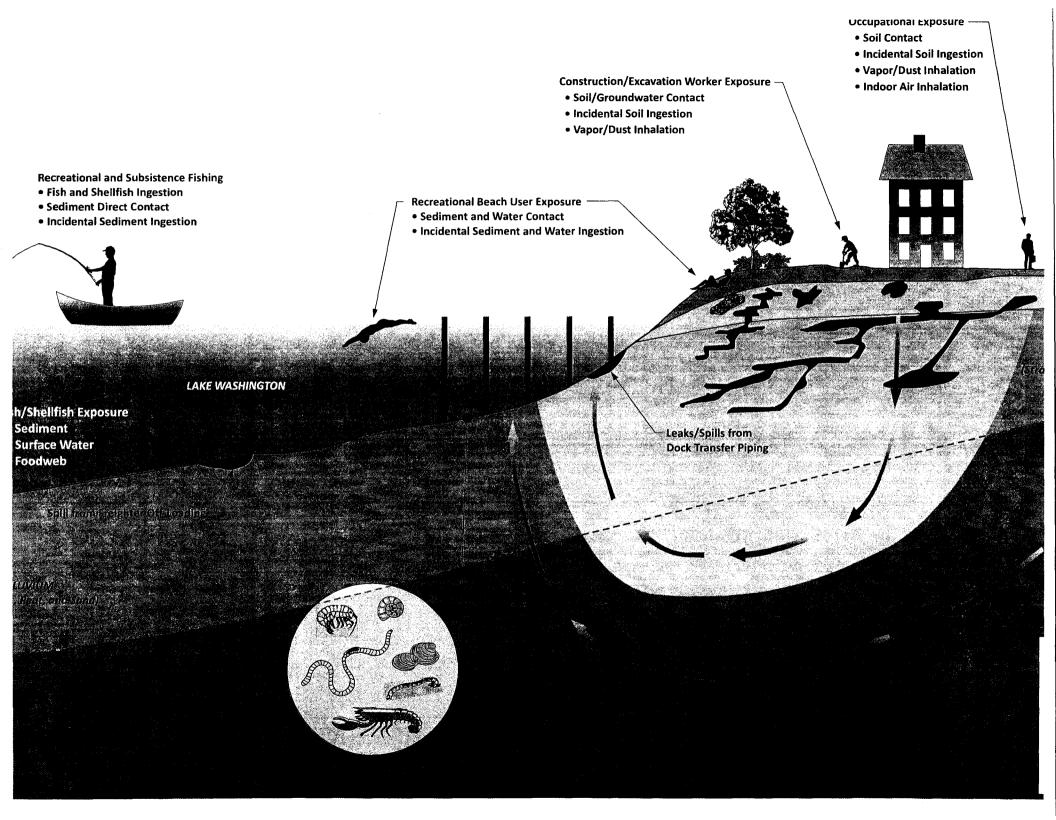


Table ES-1
Site-Specific Contaminants of Interest and Indicator Chemicals

	Enviro	nmental Mediu	m at the Quenc	lall Site
			at the quell	
		}		Sediment
			Bulk	Porewater/
Chemical	Groundwater	Soil	Sediment	Surface Water
Metals				
Astrono				
Cadmium				
(Indianamenti)		76	Sin U.S.	F-34
COPPER SECTION OF SECT				
Lead				
Nickel				
Iron				
Zinc				
Polynuclear Aromatic Hydrocarbons (PAHs)		•		
Acceptable				
Acenaphthylene Anthracene				
Benzo(a)anthracene	W			
Benzo(a)pyrene		***		
Benzo(b)fluoranthene		· · · · · · · · · · · · · · · · · · ·		
Benzo(k)fluoranthene				
Chrysene		V-10-0-		
Dibenz(a,h)anthracene		7		
Indeno(1,2,3-c,d)pyrene				
Fluoranthene				
Fluorene				
Averdegaetene				
Phenanthrene	(mil.) 1989 (2000) taka a ta ta da ta mana a ta a ta a ta ta ta ta da	1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1	necessor members to the contract of the contra	
Pyrene				1.0
2-Methylnaphthalene				
There of AFT 139 (minutesembly GNEW WICE)	X-115			
Properties of States with the second	de de la Companya de	wasi		
Formus at the Powers of the Second		X 77		
Constitution of the second				12.01. 2. 2
Semivolatiles, Miscellaneous				
Bis(2-Ethylhexyl)phthalate				
Dibenzofuran				
n-Nitroso-diphenylamine				
Semivolatiles, Phenolic				
Pheno		S AND A		
2-Methylphenol				W) 11 11 11 11 11 11 11 11 11 11 11 11 11
Mathrigh and				
2,4-Dimethylphenol				
Semivolatiles, Chlorinated				
ional Polydhiojinered Bij henylk (PGBs)		Z Z Z	is late.	
Pentasata on jerov (KAP)			a pelopera de la companya de la comp	

Table ES-1
Site-Specific Contaminants of Interest and Indicator Chemicals

	Environmental Medium at the Quendall Site						
Chemical	Groundwater	Soil	Bulk Sediment	Sediment Porewater/ Surface Water			
Volatiles, Aromatic and Halogenated							
Baikede		<b>.</b>					
Ethylbenzene			AND THE CONTRACT OF THE CONTRA				
Toluene				1			
Dichloromethane							
Carbon Disulfide							
Xylenes		——·					
Styrene		<del></del>	1				
Methylene Chloride							
Chloroform							
Other							
જારા ભારતના હિલ્લા એના							

#### **Notes:**

Indicator chemicals are shaded.

The media associated with each indicator chemical are denoted with an "X".

**CAEPA - California Environmental Protection Agency** 

cPAH - carcinogenic PAH(s) (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[a,h] anthracene, and indeno [1,2,3-c,d]pyrene)

ESBQ - equilibrium partitioning sediment benchmark (ESB) quotient

HPAHs - high-molecular-weight PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene, chrysene, dibenz[a,h]anthracene, indeno[1,2,3,-c,d]pyrene, fluoranthene, and pyrene)

LPAHs - low-molecular-weight PAHs (acenaphthylene, acenaphthene, anthracene, fluorene, naphthalene, and phenanthrene)

TEQ - toxicity equivalency quotient

<sup>&</sup>lt;sup>1</sup> Soil conditions at the Site are characterized by high organic content, supporting a reducing environment, and neutral pH. Because the oxidizing environment required to maintain chromium (VI) is not present at the Site, chromium (VI) was not retained as a contaminant of interest.

Table ES-2
Summary of DNAPL Thickness and Volume by Source Area

Source Area	Approximate Area in Acres	Cumulative Average/Maximum DNAPL Thickness in Feet	Average/ Maximum Depth of DNAPL in Feet	Volume of DNAPL- Contaminated Soil and/or Sediment in Cubic Yards	DNAPL Volume in Gallons	Percentage of DNAPL Logged as Oil-Wetted <sup>1</sup>
Former May Creek Channel Area (soil only)	1.5	2.9 / 8.8 (Max. at MC-1)	17 / 34 (Max. at BH-30C)	7,100	88,000	40%
Still House Area (soil only)	2.2	2.2 / 4 (Max. at BH-8)	11 / 14 (Max. at QP-7)	8,100	100,000	27%
Quendall Pond /North Sump Area (soil and sediment)	4.1	2.3 / 6 (Max. at SP-5)	16 / 27 (Max. at BH-20C)	16,000	200,000	36%
Railroad Loading Area (soil only)	0.23	4.9 / 11 (Max. at Q2-D)	22 / 30 (Max. at Q2-D)	1,700	21,000	20%
T-Dock Area (sediment only)	1.7	1.0 / 3.8 (Max. at VT-4)	1.5 / 3.8 (Max. at VT-4)	2,900	36,000	0%
Total	9.7			36,000	445,000	

#### Notes:

DNAPL - dense non-aqueous phase liquid

<sup>1</sup>Cumulative thickness of DNAPL logged as oil-wetted divided by cumulative DNAPL thickness (including oil-coated, oil-wetted, and unknown [undifferentiated] DNAPL).

Table ES-3
Summary of Risk and Hazard Estimates for Human Exposure Scenarios

		-				He	uman Expos	ure Scenari	os				
						Constri	uction/	Recrea	ational	1		Subsis	tence
		Resid	ential	Occupation	nal Worker	Excavatio	n Worker	Beach	User	Recreation	al Fishing	Fish	ing
Exposure Medium	Exposure Route	н	ELCR	н	ELCR	Ні	ELCR	ні	ELCR	н	ELCR	ні	ELCR
	Ingestion	1	21502	0.4	#1(£10:18)	1	115-021-5						
Soil (0 to 15 feet bgs)	Dermal	0.5	L ZEOS	0.3	g: g	0.4	5E-05						
	Inhalation	6	0300	1	5E-05	1	2E-06						
	Total	8	¥J5 (02)	2	2E-03	3	2E-04						
	Ingestion	(5)022	iis ou c										
Groundwater	Dermal	75	5:22			0.00001	1E-05						
Groundwater	Inhalation	1-7/25E	SI5 (0)										
	Total	7/305	\$6(240)			0.00001	1E-05						
ndoor Air	Inhalation	21:0	2502										
Trench Vapor	Inhalation					486	(ABE-048)						
	Ingestion							0.004	2(E-04)				
Nearshore Sediment	Dermal							0.01	9E-05				
	Total							0.02	253E-04				
	Ingestion									0.008	2E-05	0.01	4E-05
Site-Wide Sediment	Dermal									0.005	2E-05	0.01	3E-05
	Total									0.01	4E-05	0.02	6E-05
	Ingestion							0.007	2E-06				
Site Surface Water	Dermal							0.02	2E-06				
	Total							0.03	3E-06				
Site Fish/Shellfish	Ingestion									0.4	2501	3	N°5E0B
	Ingestion							0.001	2E-06	0.0002	7E-08	0.0003	1E-07
Background Sediment	Dermal	-						0.00005	7E-07	0.000001	5E-08	0.000002	8E-08
	Total							0.001	3E-06	0.0002	1E-07	0.0003	2E-07
Background Fish/Shellfish	Ingestion									0.0004	2E-06	0.003	4E-05

#### Notes:

<sup>a</sup>Due to the very high concentrations found in well Q9 and the inherent limitations quantifying risk at these levels, the ELCR is reported as a "greater than" estimate. Risks to future residents from exposure to groundwater and indoor air were estimated from the maximum single-well risk.

Risks to construction/excavation workers from exposure to groundwater and trench vapor were estimated from maximum detected concentrations from all wellpoints.

bgs - below ground surface ELCR - excess lifetime cancer risk

HI - hazard index; HQ - hazard quotient

Boldface without highlighting - HQ greater than 1 or ELCR greater than 1E-06

Boldler ប៉ូរ៉េបាស្តីទូសម្តែកអត្ថ ដែលមានសមាជាសំណើមកដល់ នេះជានិងសំណើងនៅនៃ 🗟 🚉

Table ES-4
Chemicals of Concern by Medium

							Medium						
	S	oil	Groundwater	Indoor Air	Trench Vapor		Water/ water		rshore ment		Wide ment	Fish/ Shellfish <sup>b</sup>	Food/Prey Item
Chemical of Concern	HHRA	ERA	HHRA	HHRA	HHRA	HHRA	ERA	HHRA	ERA	HHRA	ERA	HHRA	ERA
2-Methylnaphthalene	X		X				×			·		х	
Acenaphthene	<u> </u>	via LPAH	Х				Х		via LPAH		via LPAH	<u> </u>	via LPAH
Anthracene		via LPAH					Х		via LPAH		via LPAH		via LPAH
Arsenic	X		Х			-		<u> </u>	1		1.0		710 21711
Benzene			Х	Х	Х	X		<del></del>	<del>                                     </del>		<b></b>		-
Benzo(a)anthracene	X	via HPAH	Х				х	1	via HPAH		via HPAH	X	via HPAH
Benzo(a)pyrene	Х	Х	Х				x	X	X	X	X	×	X
Benzo(b)fluoranthene	X	via HPAH	Х				···	<u> </u>	via HPAH		via HPAH		via HPAH
Benzo(k)fluoranthene	X	via HPAH	Х						via HPAH		via HPAH		via HPAH
Chromium		Х											
Chrysene			х						1		<del>                                     </del>		
Dibenz(a,h)anthracene	Х	via HPAH	X					X	via HPAH	Х	via HPAH	х	via HPAH
Dibenzofuran			Х										
Ethylbenzene	X		X	Х	Х				1 1		· · · · · · · · · · · · · · · · · · ·	-	
Fluoranthene		via HPAH	X				X		via HPAH		via HPAH		via HPAH
Fluorene		via LPAH	X			****	Х	1	via LPAH		via LPAH		via LPAH
Indeno(1,2,3-cd)pyrene	Х	via HPAH	X						via HPAH		via HPAH		via HPAH
Lead		Х							1				X
Naphthalene	Х	Х	Х	Х	х		Х	1	via LPAH		via LPAH		via LPAH
PAH ESBQ TU							х		1				
Pentachlorophenol		X										~-	Х
Phenanthrene		via LPAH					х		via LPAH		via LPAH		via LPAH
Pyrene .		via HPAH	Х				Х	1	via HPAH		via HPAH	1	via HPAH
Toluene							Х				1		
Total 10 of 16 HPAHs (U=1/2)		Х							Х		×		X
Total 16 PAHs (U=1/2)						· · · · · · · · · · · · · · · · · · ·			×		X		X
Total 6 of 16 LPAHs (U=1/2)		Х									X		X
Total Xylenes			X	Х	х						<del> </del>		

#### Notes

COC - chemical of concern

ERA - ecological risk assessment

ESBQ - equilibium partioning sediment benchmark quotient

HHRA - human health risk assessment

HPAHs - high-molecular-weight PAHs

LPAHs - low-molecular-weight PAHs

PAHs - polynuclear aromatic hydrocarbons

TU - toxic unit(s)

U=1/2 denotes that when results were summed, non-detects were valued at one-half the detection limit

via HPAH - Denotes that the COC is evaluated for sediment as part of the HPAH group

via LPAH - Denotes that the COC is evaluated for sediment as part of the LPAH group

X - indicates that the chemical is a COC for the specific medium.

<sup>&</sup>lt;sup>a</sup> Chemicals of concern identified as those associated with hazard quotients exceeding 1 or excess lifetime cancer risk exceeding 1 x 10<sup>6</sup>.

<sup>&</sup>lt;sup>b</sup> Based on modeled tissue concentrations from sediment, using biota-sediment accumulation factors.

<sup>&</sup>lt;sup>c</sup> For the HHRA, soil from 0 to 15 feet below ground surface was evaluated.

<sup>&</sup>lt;sup>d</sup> For the ERA, soil from 0 to 5 feet below ground surface was evaluated.

### **CITY OF RENTON COUNCIL AGENDA BILL**

Subject/Title: EIS Consultant Contract for Quendall Terminals (LUA09-151)	<b>Meeting:</b> Regular Council - 19 Jul 2010
Exhibits: Issue Paper Blumen QT Contract Phase II and III Blumen Scope Phase II Blumen Scope Phase III	Submitting Data: Dept/Div/Board: Community and Economic Development Staff Contact: Vanessa Dolbee
Recommended Action: Refer to the Finance Committee	

Fiscal Impact:	
Expenditure Required: \$	Transfer Amendment: \$
Amount Budgeted: \$	Revenue Generated: \$
Total Project Budget: \$	City Share Total Project: \$

#### **SUMMARY OF ACTION:**

The proposed mixed-use development Quendall Terminals was submitted to the City on November 18, 2009. The project applicant is Campbell Mathewson of Century Pacific, L.P. and the property owners are Altino Properties, Inc. and J.H. Baxter & Co. The application was determined to be complete on February 5, 2010 and a SEPA Determination of Significance was issued by the Environmental Review Committee (ERC) on February 15, 2010. As a result of the ERC's decision, the applicant and the City are required to complete an EIS for the subject project. Pursuant to Renton Municipal Code section 4-1-170, the applicant is required to finance 100% of the costs of EIS coordination, review, and appeals. After a Request for Proposals process, the City has selected Blumen Consulting Group, Inc. to complete the EIS work for the Quendall Terminals Development project. The costs included in this contract would be for Phases 2 and 3 of the EIS (Phase 2 would be \$125,975 and Phase 3 would be \$32,000). If Council authorizes the execution of this contract with Blumen Consulting Group, Inc., a pass-through account would be setup to forward all cost of the consulting services to the project applicants.

#### **STAFF RECOMMENDATION:**

Approve the contract with Blumen Consulting Group, Inc., in the amount of \$157,975, and authorize the Mayor and City Clerk to sign it.

# DEPARTMENT OF COMMUNITY AND ECONOMIC DEVELOPMENT



### M E M O R A N D U M

DATE:

July 1, 2010

TO:

Don Persson, Council President

Members of the Renton City Council

VIA:

Denis Law, Mayor

FROM:

Alex Pietsch, Administrator

STAFF CONTACT:

Vanessa Dolbee, Senior Planner (ext. 7314)

SUBJECT:

EIS Consultant Contract for Quendall Terminals (LUA09-151)

#### ISSUE:

Should the City enter into a service contract with Blumen Consulting Group, Inc. for the Quendall Terminals EIS and set up a pass through account for the Quendall Terminals project applicant to fund the EIS work completed by Blumen Consulting Group, Inc.?

#### **RECOMMENDATION:**

Authorize the Mayor and City Clerk to execute the EIS Services Contract with Blumen Consulting Group, Inc., in the amount of \$157,975 for the completion of the Draft EIS, and Final EIS for the Quendall Terminals development project (LUA09-151).

#### **BACKGROUND SUMMARY:**

The Quendall Terminals application for a mixed-use development, located at 4350 Lake Washington Blvd. was submitted to the City on November 18, 2009. The project applicant is Campbell Mathewson of Century Pacific, L.P. and the property owners are Altino Properties, Inc. and J.H. Baxter & Co. The applicant has requested Master Plan Review, Binding Site Plan, Shoreline Substantial Development Permit, and SEPA Environmental Review. The site is 21.46-acres and is zoned Commercial/Office/Residential (COR). The 21.46-acres site would be divided into 7 lots of which 4 would contain 6 to 7 story mixed-use buildings. Overall, the development would consist of 800 residential units (resulting in a net residential density of 46.4 units/acre), 245,000 square feet of office, 21,600 square feet of retail, and 9,000 square feet of restaurant space. The applicant has proposed to dedicate 3.65 acres for public right-of-way, which would provide access to the 7 proposed lots. Surface and structured parking would be provided for 2,171 vehicles. The site contains 1,583 linear feet of

Don Persson, Council President Page 2 of 2 July 1, 2010

shoreline along Lake Washington. Proposed improvements include stormwater and sewer improvements. The subject site has received a Superfund designation from the U.S. Environmental Protection Agency (EPA) and the property owners are currently working on a remediation plan with EPA. The site presently contains approximately 0.81 acres of wetlands, all of which would be filled as part of the remediation process.

The application was determined to be complete on February 5, 2010 and a SEPA Determination of Significance was issued by the Environmental Review Committee (ERC) on February 15, 2010. As a result of the ERC's decision, the applicant and the City are required to complete an EIS for the subject project. Pursuant to Renton Municipal Code section 4-1-170, the applicant is required to finance 100% of the costs of EIS coordination, review, and appeals. After a Request for Proposals process, the City has selected Blumen Consulting Group, Inc. to complete the EIS work for the Quendall Terminals Development project. In Blumen's proposal for the EIS work, they identified three phases of work: Phase 1 – Project Initiation/Scoping, Phase 2 – Draft EIS, and Phase 3 – Final EIS. Under a separate contract, Blumen Consulting Group completed Phase 1, Project Initiation/Scoping, which resulted in a total cost of \$11,500 to the applicant. The costs included in this contract would be for Phases 2 and 3 of the EIS (Phase 2 would be \$125,975 and Phase 3 would be \$32,000).

If Council authorizes the execution of this contract with Blumen Consulting Group, Inc., a pass-through account would be setup to forward all cost of the consulting services to the project applicants.

#### CONCLUSION:

This contract will allow the City to complete the EIS for the Quendall Terminals project and would not result in additional cost to the City pursuant to RMC 4-1-170.

cc: Chip Vincent, Planning Director

#### **CONSULTANT AGREEMENT**

THIS AGREEMENT is made as of the day of , 2010, between the CITY OF RENTON, a municipal corporation of the State of Washington, hereinafter referred to as "CITY" and Blumen Consulting Group, Inc., hereinafter referred to as "CONSULTANT", for them to prepare and issue an EIS for the Quendall Terminals project, Phases II and III. Information shall be made available for use by the City of Renton Staff and City Council.

The CITY and CONSULTANT agree as set forth below:

- 1. Scope of Services. The Consultant will provide all labor necessary to perform all work, which is described in the attached Scope of Services (Exhibit A). This Agreement and Exhibit hereto contain the entire agreement of the parties and supersedes all prior oral or written representation or understandings. This Agreement may only be amended by written agreement of the parties. The scope of work may be amended as provided herein.
- Changes in Scope of Services. The City, without invalidating the Consultant Agreement, may order changes in the services consisting of additions, deletions or modifications, and adjust the fee accordingly. Such changes in the work shall be authorized by written agreement signed by the City and Consultant. If the project scope requires less time, a lower fee will be charged. If any provision of this Agreement is held to be invalid, the remainder of the Agreement shall remain in full force and effect to serve the purposes and objectives of this Agreement.
- 3. Time of Performance. The Consultant shall complete performance of the Consultant Agreement for the items under Consultant's control in accordance. If items not under the Consultant's control impact the time of performance, the Consultant will notify the City.
- 4. Term of Consultant Agreement. The term of this Agreement shall end at completion of the scope of work identified in Exhibit A, but no later than March 31, 2011. This Agreement may be extended to accomplish change orders, if required, upon mutual written agreement of the City and the Consultant.
- 5. Consultant Agreement Sum. The total amount of this Agreement is not to exceed the sum of one hundred fifty-seven thousand, nine hundred seventy-five dollars (\$157,975). Washington State Sales Tax is not required. The Cost Estimate provided by the Consultant to the City specifies total cost.
- 6. Method of Payment. Payment by the City for services rendered will be made after a voucher or invoice is submitted in the form specified by the City. Payment will be made within thirty (30) days after receipt of such voucher or invoice. The City shall have the right to withhold payment to the Consultant for any work not completed in a satisfactory manner until such time as the Consultant modifies such work so that the same is satisfactory.
- 7. Record Maintenance and Work Product. The Consultant shall maintain accounts and records, which properly reflect all direct and indirect costs expended and services provided in the performance of this Agreement. The Consultant agrees to provide access to any records required by the City. All originals and copies of work product, exclusive of Consultant's proprietary items protected by copyright such as computer programs, methodology, methods, materials, and forms, shall belong to the City, including records, files, computer disks, magnetic media or material which may be produced by Consultant while performing the services.

Consultant will grant the City the right to use and copy Consultant copyright materials as an inseparable part of the work product provided.

- **8. Assignment Agreement.** The Consultant shall not assign any portion of this consultant Agreement without express written consent of the City of Renton.
- 9. Hold Harmless. The Consultant shall indemnify, defend and hold harmless the City, its officers, agents, employees and volunteers, from and against any and all claims, losses or liability, or any portion thereof, including attorneys fees and costs, arising from injury or death to persons, including injuries, sickness, disease or death of Consultant's own employees, or damage to property caused by a negligent act or omission of the Consultant, except for those acts caused by or resulting from a negligent act or omission by the City and its officers, agents, employees and volunteers. Should a court of competent jurisdiction determine that this agreement is subject to RCW 4.24.115, then, in the event of liability for damages arising out of bodily injury to persons or damages to property caused by or resulting from the concurrent negligence of the consultant and the city, its officers, officials, employees and volunteers, the consultant's liability hereunder shall be only to the extent of the consultant's negligence. It is further specifically and expressly understood that the indemnification provided herein constitute the consultant's waiver of immunity under the Industrial Insurance Act, Title 51 RCW, solely for the purposes of this indemnification. This waiver has been mutually negotiated by the parties. The provisions of this section shall survive the expiration or termination of this agreement.
- 10. Insurance. The Consultant shall secure and maintain commercial liability insurance in the amount of \$1,000,000 in full force throughout the duration of this Consultant Agreement. It is agreed that on the CONSULTANT's policy, the City of Renton will be named as Additional Insured(s) on a non-contributory primary basis. A certificate of insurance and the Primary & Non-Contributory Additional Insurance Endorsement page, properly endorsed, shall be delivered to the City before executing the work of this agreement. Please note: The cancellation language should read "Should any of the above described policies be cancelled before the expiration date thereof, the issuing company will mail 45 days written notice to the certificate holder named to the left."
- 11. Independent Consultant. Any and all employees of the Consultant, while engaged in the performance of any work or services required by the Consultant under this agreement, shall be considered employees of the Consultant only and not of the City. The Consultant's relation to the City shall be at all times as an independent consultant. Any and all claims that may or might arise under the Workman's Compensation Act on behalf of said employees, while so engaged, and any and all claims made by a third party as a consequence of any negligent act or omission on the part of the Consultant's employees, while so engaged on any of the work or services provided to be rendered herein, shall be the sole obligation and responsibility of the Consultant.
- 12. Compliance with Laws. The Consultant and all of the Consultant's employees shall perform the services in accordance with all applicable federal, state, county and city laws, codes and ordinances. Discrimination Prohibited: Consultant, with regard to work performed under this agreement, will not discriminate on the grounds of race, color, national origin, religion, creed, age, sex, the presence of any physical or sensory handicap, or sexual orientation, in the selection and/or retention of employees, or procurement of materials or supplies.

This agreement is entered into as of the day and year written above.

### CONSULTANT

	and
Michael Blumen	
Blumen Consulting Group	
720 Sixth St, Ste 100	
Kirkland, WA 98033	
QUENDALL TERMINALS, a joint venture	of Altino Properties, Inc. and J. H. Baxter & Co.
BY:	BY:
Altino Properties	J. H. Baxter & Co.
Title:	Title:
Date:	Date:
CITY OF RENTON	
Desirit	
Denis Law Mayor	
iviayoi	
APPROVED AS TO FORM:	ATTEST:
City Attorney	Bonnie I. Walton, City Clerk

City of Renton Planning Division



May 24, 2010

MAY 25 2010

425-284-5401 FAX 425-284-5402 www.blumencg.com 720 Sixth St. S, Suite 100 Kirkland, WA 98033

Vanessa Dolbee, (Acting) Senior Planner City of Renton Department of Community & Economic Development 1055 South Grady Way Renton, WA 98057

RECEIVED

RE: **Quendall Terminals** 

Phase 2 - Prepare the Preliminary Draft EIS and Issue the DEIS, Scope of Work

and Budget

Dear Vanessa:

Blumen Consulting Group, Inc. (BCG) is pleased to submit this Scope of Work and Budget to the City of Renton to provide services related to the next phase of the Quendall Terminals EIS Phase 2 - Prepare the Preliminary Draft EIS (PDEIS) and Issue the Draft EIS (DEIS). We welcome the opportunity to continue to assist you with the SEPA process on this project.

Our previous Phase 1 Scope of Work and Budget covered services through EIS project initiation and EIS scoping. During that phase, BCG assisted you on a number of tasks related to SEPA. Specific deliverables that we prepared during Phase 1 included: materials for the scoping meeting, Scoping Summary, EIS Schedule and Information Needs Memo. We have formulated a scope of work and budget to cover our services for the next phase of the EIS (through issuance of the DEIS). In the event that the overall approach to the EIS is modified or the timeline is substantially extended, our scope of work and budget may need to be amended to reflect additional services or the change in approach.

The following Scope of Work identifies a list of tasks associated with preparing and submitting the Preliminary DEIS to the City and applicant (Phase 2A) and revising and issuing the DEIS in response to comments (Phase 2B). The scope of work and budget associated with Phase 3 of the EIS process would be determined subsequent to receipt of comments on the DEIS.

We propose to use the services of the following BCG sub-consultants for certain elements of the DEIS (AESI - earth/environmental health, Raedeke Associates - wetlands/riparian habitat, TENW - transportation and Primedia Group - visual simulations).

#### SCOPE OF WORK

As indicated in our March 2010 Proposal (attached to our original 4.14.10 Agreement with the City), BCG will provide services on the Quendall Terminals EIS on a phased basis, as follows: Phase 1 - Project Initiation/Scoping (completed), Phase 2 - Prepare PDEIS and Issue DEIS, Phase 3 - Prepare and Issue Final EIS. Accordingly, we have formulated a scope of work and budget for Phase 2 of the EIS (broken down into sub-phases 2A and 2B). Below are our assumptions and specific tasks that will be completed by BCG for Phases 2A and 2B

Quendall Terminals Phase 2 - Prepare PDEIS and Issue DEIS Blumen Consulting Group, Inc. May 24, 2010

#### **Assumptions**

BCG will manage preparation of the DEIS, in coordination with the EIS team and under the direction of City of Renton. Following are our key assumptions for the PDEIS and DEIS.

#### **Background Information**

A considerable amount of information and analysis has been produced for the cleanup/remediation and master planning efforts. We assume that we will build upon this in preparing the PDEIS. However, BCG will need additional information to prepare the PDEIS that is reflected in our *Information Needs Memo* submitted to the City on May 19<sup>th</sup>. We assume we will receive such information from the applicant's team, as applicable.

#### **Elements of the Environment**

The City preliminarily identified the following environmental elements for discussion in the DEIS: Earth, Aesthetics/Views, Land and Shoreline Use, Critical Areas, Recreation/Public Access, Public Services, Utilities, Vegetation and Transportation/Traffic. As a result of scoping and in compliance with State regulations, we propose the following final list of environmental elements: Earth, Environmental Health, Aesthetics/Views, Land and Shoreline Use/Relationship to Plans Policies. Critical Areas. Parks and Recreation, Transportation/Traffic Energy/Greenhouse Gas Emissions. See below for further descriptions of what would be included in these elements. In a few instances, we have consolidated elements from the City's preliminary list (i.e. we have folded Vegetation into Critical Areas, Utilities into Earth and Public Services into Transportation/Traffic) to better address the specific issues that relate to a given element.

#### **Proposed Action and Alternatives**

We assume that the proposal, the No Action Alternative and one lower density redevelopment alternative will be evaluated in the DEIS.

#### Site Cleanup/Remediation

We understand that the site will undergo cleanup/remediation under its status as a Superfund site by EPA, and that cleanup plans are currently being developed. As part of that process, applicable cleanup methods will consider potential redevelopment plans for the site. Certain issues potentially related to redevelopment, such as grading, treatment of wetlands, utility/building construction, public access, etc., will be resolved in coordination with EPA, the City and other agencies. The DEIS will integrate with ongoing remediation efforts. The DEIS will briefly summarize the history of the site and the site's current conditions; refer to the CERCLA process and its regulatory requirements; and, discuss protocols and institutional controls that will ultimately set out requirements and compliance methods for construction and long-term redevelopment. The DEIS will assume a baseline condition subsequent to cleanup; this baseline condition will form the basis for evaluation of potential impacts associated with redevelopment. Therefore, only the probable significant impacts and applicable mitigation measures related to

redevelopment will be addressed in this DEIS; we assume that potential impacts associated with cleanup activities will be addressed through the EPA process.

Consolidated Comments

We assume that we will receive one consolidated set of comments from the City and one consolidated set from the applicant on the first and second PDEISs, and that these comments will not require any major new analysis, but will be more editorial-type changes and clarifications to the EIS analyses. No more than two versions of the PDEIS are assumed prior to BCG finalizing the DEIS for issuance.

# Phase 2A (Prepare and Submit the Preliminary DEIS to the City and Applicant)

The following specific tasks will be completed by the BCG team in Phase 2A:

- Task 1: Coordinate with the City and the applicant to obtain all relevant information for the PDEIS. This includes monitoring the status and progress of responses to our Information Needs Matrix distributed to the City and applicant on 5.19.10; review of this information; and, provision of comments to finalize the information.
- Task 2: Coordinate with the City and other team members to identify graphic needs. It is assumed that the applicant and/or applicant's consultants will produce certain graphics required for the PDEIS (many of these are likely already included in the application package submitted to the City in November 2009, but may need to be manipulated for the PDEIS). Other graphics will be produced directly by the BCG team. For purposes of this scope and budget, we assume that up to 25 graphics will need to be produced for the PDEIS.
- **Task 3:** Prepare a Description of the Proposed Actions and Alternatives chapter of the PDEIS, based on plans/graphics and information provided in response to our Information Needs Memo. We will circulate this chapter to the City, applicant and EIS team for review and use.
- Task 4: Coordinate the efforts of the EIS technical team, including monitoring of progress, assisting in resolving technical issues that arise, reviewing all draft reports, and commenting on and incorporating the final technical reports into the PDEIS.

  Technical reports and information for the following elements are assumed.

**Earth** – Geotechnical conditions will be the focus of this section. The 2009 application package includes a geotechnical report prepared by Aspect Engineering. We assume that this report will form the basis for the geotechnical analysis. Some additional analysis will be conducted by AESI to assess the specific potential geotechnical impacts from redevelopment. We assume that the potential impacts from any additional grading, settlement of buildings and utilities and other construction activities associated with redevelopment will be included in this section. A discussion of the relationship of site remediation requirements to building and utility construction and maintenance (stormwater, sewer and water) will also be provided (see the *Site Remediation Assumptions* above for details). Finally, the potential for groundwater impacts from redevelopment will be discussed.

AESI will prepare a supplemental report with their findings relative to geotechnical conditions and impacts/mitigation associated with redevelopment that will be included as an appendix to the DEIS. This report will also include a brief summary discussion of site remediation conditions, regulations, process and preliminary cleanup methods and plans for the site related to geotechnical issues (see the *Site Remediation Assumptions* above for details).

Environmental Health — This section will address environmental health-related conditions at the site, and in the surrounding area. Information from the 2009 Aspect Engineering report will be the basis of this section. Some additional analysis will be conducted by AESI to assess the specific potential environmental health-related impacts from redevelopment. The history, cleanup process and methods, institutional controls and remediation plan for the site will be briefly discussed in this section (see the Site Remediation Assumptions above for details). The potential for construction and operation of the proposed redevelopment to result in environmental health risks (i.e. from interaction with or release of contaminants at the site) will be evaluated. As appropriate, mitigation measures will be identified to address potential impacts.

AESI will include their findings related to environmental health in the supplemental report that will be included as an appendix to the DEIS (see Earth above). This report will also include a summary discussion of site remediation conditions, regulations, process and preliminary cleanup methods and plans for the site related to health-related issues (see the *Site Remediation Assumptions* above for details).

Aesthetics/Views – Given that the site is located within the Lake Washington shoreline environment, the aesthetic character of the area and views of the shoreline from surrounding areas could be impacted by the proposed redevelopment. Primedia Group will prepare visual simulations of the proposed redevelopment from selected viewpoints (up to 10 viewpoints will be depicted in the analysis). It is assumed that Lance Mueller (the applicant's architect) will provide CADD files of the site terrain and proposed buildings for these simulations (see our Information Needs Memo). BCG will direct this analysis and provide the write-up for the section in the DEIS. A discussion of potential aesthetic impacts/changes with proposed redevelopment (i.e. related to the height/bulk/scale of the proposed buildings) and potential light and glare impacts will also be provided in this section.

Critical Areas – Wetlands and riparian habitat will be the focus of this section. The 2009 application package includes a wetlands and habitat report prepared by Anchor Environmental. We assume that this report will form the basis for the analysis. Additional analysis of potential direct/indirect impacts from proposed redevelopment on retained/created wetlands and riparian habitat will be evaluated by Raedeke Associates. In particular, the potential for impacts to critical areas from construction and operation of the proposed stormwater control facilities will be discussed. No additional fieldwork to delineate or confirm wetlands is assumed. This section will include a brief discussion of the relationship of the remediation plan to wetland conditions (see the Site Remediation Assumptions above for details). Proposed landscaping, both ornamental and native, with site redevelopment will be described.

Raedeke will prepare a supplemental report with their findings relative to wetlands and riparian habitat conditions and impacts/mitigation associated with redevelopment that will be included as an appendix to the DEIS. This report will also include a summary discussion of site remediation conditions, regulations, process and preliminary cleanup methods and plans for the site related to critical areas (see the *Site Remediation Assumptions* above for details).

**Transportation/Traffic** - The 2009 application package includes a transportation report prepared by the Transpo Group. We assume that information from this report will be used for the transportation/traffic analysis. Further analysis will be conducted by TENW for the EIS (i.e. to account for additional background projects and operations at four additional intersections). Modeling by TENW for this analysis will be performed using the City's model (see TENW's outline submitted to the City on 5.17.10 for details). A discussion of fire service access to the site will be included in this section. BCG will coordinate with the City Fire Department for this discussion.

TENW will prepare a supplemental report with their findings relative to transportation/traffic conditions and impacts/mitigation associated with redevelopment that will be included as an appendix to the DEIS.

Task 5: Serve as the principal author of the PDEIS, directly prepare the Fact Sheet and certain sections of the impacts analysis (i.e. Aesthetics/Views, Land and Shoreline Use/Relationship to Plans and Policies, Parks and Recreation and Energy/Greenhouse Gases), and incorporate the technical analyses into the PDEIS (see above). It is proposed that the Summary chapter of the PDEIS not be produced until after the City and applicant review of the first PDEIS, in case substantive changes to other sections of the document are required based on comments.

Land and Shoreline Use/Relationship to Plans and Policies – This analysis will focus on the compatibility of the proposed redevelopment with surrounding land and shoreline uses. Compatibility will be discussed in terms of the proposed land use types and intensity (i.e. related to construction traffic and pedestrian activity from the redevelopment, and general increases in population and employment at the site), and the height/bulk/scale of the proposed buildings (see Aesthetics above). This section will also include a discussion of the relationship of the proposal to relevant plans, policies and regulations (including the City's Comprehensive Plan, COR zoning regulations and Shoreline Master Program policies and regulations).

Parks and Recreation – This analysis will describe the remediation process and its relationship to proposed site redevelopment and resulting public access opportunities to the shoreline. The proposed project's consistency with the Shoreline Master Program goals, policies and regulations related to public access will also be mentioned (see Plans and Policies above). Potential impacts to public park and recreation facilities in the site vicinity from new residents/employees at the proposed redevelopment will be addressed. Proposed open space and recreational facilities will be described and other appropriate mitigation identified (including payment of impact fees).

Energy/Greenhouse Gas Emissions (GHG) - An analysis of the potential impacts of the proposed redevelopment on global climate change in relation to GHG emissions will be conducted (as required by the State Department of Ecology). The GHG emissions of the proposal and redevelopment alternative will be estimated (using King County's GHG emissions worksheet) and will include embodied emissions, energy-related emissions and transportation-related emissions. Features that would be incorporated into the proposal to reduce the project's carbon footprint (beyond those required by City/State regulations) will be identified, if applicable.

- Task 6: Attend up to three (3) meetings through submittal of the first PDEIS to the City and applicant. This assumes meetings attended by up to two BCG personnel (2-hour meetings assumed), including meetings with the City and applicant.
- Task 7: Coordinate production of the first PDEIS and print copies for review by the City and the applicant. It is assumed that up to fifteen (15) copies of the PDEIS will be prepared at a cost of approximately \$90 per document.
- Task 8: Overall EIS project management, including: coordination with the City and the EIS team via telephone and e-mail regarding overall EIS strategies, progress, issues and schedule; and, billing and accounting.

#### Phase 2B (Revise and Issue DEIS)

The following specific tasks will be completed by the BCG team in Phase 2B:

- Task 9: Coordinate with the City and applicant to receive comments on the first PDEIS (one set of consolidated comments from each is assumed). BCG will revise the PDEIS based on the agreed-upon relevant comments (no major new analysis is assumed; should such analysis be required, a scope and budget amendment could be required). This revised document will include a Summary chapter prepared by BCG.
- **Task 10:** Coordinate production and print copies of the second PDEIS. It is assumed that ten (10) copies of the revised PDEIS will be prepared at a cost of \$90 per document.
- Task 11: Prepare the for-publication DEIS based on final comments from the City (comments are assumed to be minor, edit-level comments only).
- Task 12: Coordinate production of the DEIS for issuance and public comment (this will include coordination of printing of the DEIS, preparing cd's of the DEIS and assisting the City in placing the document on the City's website, as appropriate).
- Task 13: Attend up to two (2) additional meetings through issuance of the DEIS, for a total of five (5) meetings during Phase 2. This assumes meetings attended by up to two BCG personnel (2-hour meetings assumed), including meetings with the City and applicant.
- **Task 14:** Prepare for and attend the DEIS public hearing during the public comment period in order to obtain oral/written comments. We assume that the City will arrange for the

hearing room and court reporter/recording equipment; carry out the noticing and publication requirements in compliance with SEPA and run the meeting. BCG will help prepare draft materials, present at the hearing (if necessary) and answer questions on the DEIS and overall EIS process from the public.

Task 15: Continue overall EIS management.

**Deliverables:** BCG will produce the following deliverables during Phase 2 – Prepare PDEIS and Issue DEIS:

- First Preliminary DEIS for submittal to the City and applicant
- Second Preliminary DEIS for submittal to the City and applicant
- For-Publication DEIS for submittal to the City for final approval to publish
- Issued DEIS

#### SCHEDULE

Blumen Consulting Group is prepared to commence Phase 2 immediately upon authorization of this Contract Amendment. We submitted a detailed proposed schedule for the EIS to the City and applicant on 5.19.10. According to this schedule, BCG will prepare and submit the first PDEIS to the City and applicant on August 11<sup>th</sup> and prepare and publish the DEIS in by the end of September, if all applicable timelines are met by all parties. This schedule is contingent upon a number of key milestones noted in the schedule and memo (i.e. receiving access to the City's transportation model, confirmation of cleanup/remediation assumptions and information on the proposal and redevelopment alternative, as well as the timing and level of comments to be received from the City/applicant on the PDEIS). In the event that the timeline is substantially extended for reasons beyond our control, our scope of work and budget may need to be amended.

#### **BUDGET**

As described above, we will establish budgets for the EIS effort on a phased basis, under not-to-exceed amounts. For Phase 2 of the EIS process – Prepare PDEIS and Issue DEIS, we propose to establish a not-to-exceed amount of \$125,975. A breakdown of estimated costs is provided as Attachment A to this letter. This budget includes all BCG labor and reimbursable expenses, as well as those of our sub-consultants (AESI, Raedeke, TENW and Primedia), except for the printing costs associated with the issued DEIS (those costs will be determined based on the specific size of the document and the exact number of copies to be published for public and agency review). It covers services through issuance of the DEIS and attendance at the DEIS hearing. When added to our approved not-to-exceed budget of \$11,500 for Phase 1, our budget total would be \$137,475.

Our costs will be billed on a monthly basis, consistent with our current 2010 Fee Schedule, attached to our original Agreement with the City. At the conclusion of this phase of work and upon receipt of public/agency comments on the DEIS, we will be able to define a scope of work and not-to-exceed budget for Phase 3 – Prepare and Issue the Final EIS. BCG's scope of work and budget for Phase 3 will depend upon the specific level of comments that we receive on the DEIS.

We greatly appreciate the opportunity to assist the City on the Quendall Terminals EIS. We look forward to successfully completing the Draft and Final EISs on this project.

All of the terms and conditions specified in our original Agreement with the City still pertain, unless specifically modified herein. If this proposed Scope of Work and Budget for Phase 2 are acceptable to the City, please amend our original Agreement accordingly and return a copy to us for our files.

Gretchen Brunner, Senior Associate

Please call either of us if you have any questions.

Sincerely,

BLUMEN CONSULTING GROUP, INC.

Michael J. Blumen, President

Attachments

# Attachment A BLUMEN CONSULTING GROUP

# Phase 2 – Prepare and Issue DEIS Quendall Terminals EIS Not-to-Exceed Budget

#### **Blumen Consulting Group**

Professional Labor	<u>Hours</u>	Hourly Rate	Total (\$)
M. Blumen	60	165	9,900
G. Brunner	240	135	32,400
J. Ding	150	90	13,500
K. Hollinger	220	80	17,600
S. Mueller	45	65	<u>2,925</u>
		Subtotal	\$76,325 <sup>2</sup>
Graphics			1,700
(assumes production of 25 graphics) Reimbursable Expenses (including mileage, parking, delivery, pr	inting¹, etc.)		<u>2,950</u>
Subconsultants		Subtotal	\$4,650 <sup>2</sup>
AESI			40 000 <sup>3</sup>
Raedeke			10,000 <sup>3</sup> 8,000 <sup>3</sup>
TENW			,
Primedia			19,500 <sup>3,4</sup>
i iiii <del>o</del> uia			$\frac{7,500^3}{1}$
		Subtotal	\$45,000 <sup>3</sup>
		TOTAL	\$125,975

<sup>&</sup>lt;sup>1</sup> Assumes printing of up to 25 copies of the PDEIS for review/comment by the City and applicant during two rounds of review of this document, at an estimated cost of \$90 per document. Costs for Phase 2 do not include printing of the issued DEIS. These costs are dependent on the exact number of copies to be issued and made available for public and agency review.

<sup>2</sup> Includes BCG's combined costs for Phases 2A and 2B. BCG's total labor and expenses for Phase 2 are broken down as follows: Phase 2A: PDEIS - \$67,000; Phase 2B: DEIS - \$13,975.

<sup>3</sup> Includes a 10 percent handling charge on sub-consultants.

<sup>&</sup>lt;sup>4</sup> Includes \$4,500 for TENW to access the City's transportation model (this task is typically undertaken by City staff on a project of this type).

# PROPOSAL for EIS SERVICES

QUENDALL TERMINALS
MIXED-USE DEVELOPMENT





Submitted to City of Renton

March 12, 2010



720 Sixth Street S. Sulte 100 Kirkland, WA 98033 425.284.5401



be an internal document for use by City of Renton that briefly outlines comments received during scoping.

4. Assist the City in finalizing the EIS scope.

#### Phase 2 - Draft EIS

BCG would manage preparation of the Draft EIS. Specific tasks we would accomplish in this phase include:

- 5. Prepare a Description of the Proposed Actions and Alternatives chapter of the Draft EIS, based on information from the SEPA Checklist, site plans and information provided in response to our Information Needs Memo, subsequent to the identification of a redevelopment alternative. We will circulate this chapter to the EIS team and the City for review and use.
- 6. Coordinate the technical analyses prepared in support of the EIS.
- 7. Serve as the principal author of the Draft EIS, directly prepare the Fact Sheet and Summary Chapter, prepare certain sections of the impacts analysis (i.e. Aesthetics/Views, Land and Shoreline use, Recreation/Public Shoreline Access and Public Services), and incorporate the technical analyses into the Draft EIS.
- 8. Produce the Preliminary Draft EIS for review by the City and the applicant.
- 9. Revise the Preliminary Draft EIS based on pertinent comments received.
- 10. Coordinate production of the Draft EIS for issuance and public comment.
- 11. Prepare for and help conduct the Draft EIS public hearing during the comment period to obtain oral comments.

#### Phase 3 - Final EIS

BCG will accomplish the following tasks for the Final EIS:

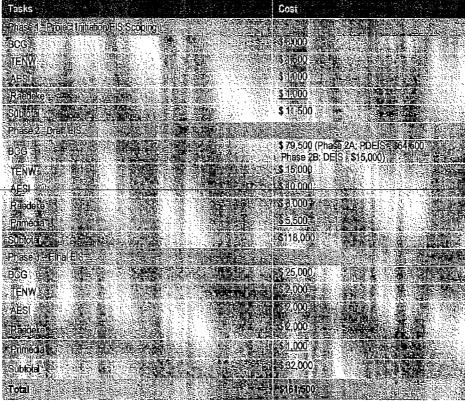
- Review all written and oral comments received on the Draft EIS and distribute applicable comments to the EIS team.
- 13. Determine whether any of the comments require further EIS analysis.
- 14. Meet with the City to discuss our approach to responding to key comments and any further analysis.
- 15. Assemble responses to comments and summaries of any additional analysis in the format of a Preliminary Final EIS for review and comment by the City and applicant.
- 16. Revise the Preliminary Final EIS base on pertinent comments received.
- 17. Coordinate production of the Final EIS for issuance.



# **Preliminary Cost Estimate**

Our preliminary estimate of the costs to prepare the Quendall Terminals EIS is provided below. This estimate is based on the use of the technical team that we have identified in our proposal. If the City determines that it is desirable and acceptable to use the technical consultant team that provided services in support of the SEPA Checklist, these costs could potentially be reduced.

We have broken down this preliminary estimate by the major EIS phases: Phase 1—Project Initiation/Scoping, Phase - 2 Draft EIS; and Phase 3—Final EIS. Costs for Phases 2 and 3 are considered preliminary, because there are a number of factors yet to be resolved (i.e. the final scope of the EIS to be determined through scoping, and the specific relationship of the EIS to the EPA site remediation processes and its implications for analysis of certain environmental elements). Also, the estimated costs for the later EIS phases (Phases 2B and 3), while based on our experience on similar projects, are more speculative, as they depend upon the level and substance of City/applicant comments on the Preliminary Draft EIS and subsequent agency and public comments on the Draft EIS. We anticipate refining the estimates for Phases 2 and 3 based on development of a detailed scope of work and schedule in collaboration with City staff.



Notes: Specific costs for Phase 2A are dependent on the resolution of the final EIS scope. Costs for Phases 2B and 3 are ultimately dependent on the level and substance of comments from the City/applicant on the Pretiminary Draft EIS, and from the public and agencies on the Draft EIS. Costs for Phases 2 and 3 do not including printing of the issued documents.



June 17, 2011

Via Email (SWPermitComments@ecy.wa.gov)

Municipal Stormwater Permit Comments Washington Department of Ecology Water Quality Program P.O. Box 47696 Olympia, WA 98504-7696

Re:

Comments on Ecology's May 16, 2011 "Preliminary Draft Language" for Phase I

and II Stormwater Permits

#### Greetings:

The following comments are submitted by Earthjustice on behalf of Puget Soundkeeper Alliance and People for Puget Sound (collectively, "PSA") on the May 16, 2011 preliminary draft language relating to low impact development ("LID") requirements for the new Phase I and II permits. This comment letter is organized first as general overall comments, followed by more specific and detailed suggestions.

# I. AS A WHOLE, THE PROPOSAL FAILS TO REQUIRE LID TO THE MAXIMUM EXTENT PRACTICABLE.

Overall, we find the draft proposal to be a significant disappointment that fails to meet the PCHB's direction to require LID where feasible and set a standard that actually protects water quality and beneficial uses like salmon. While the proposal may slow the rate of degradation in Puget Sound, it still allows new development in ways that make environmental conditions worse by removing vegetated cover and adding new effective impervious area. It does not call for the dramatic paradigm shift that is required by law, as well as by the urgency to change development practices to protect and restore Western Washington's imperiled water resources. Moreover, by emphasizing onsite infiltration to the exclusion of other approaches and underemphasizing protection of native vegetation and reduction in disturbance footprints, this proposal may actually encourage failure of LID BMPs and result in a retreat from the LID approach. We are particularly concerned that the draft has veered away from a general performance standard approach to a "mandatory list" for most sites. This is especially true given: 1) the failure of the mandatory lists to include many commonly accepted LID techniques and 2) the breadth of various exemptions provided, particularly in the name of "feasibility." We think that the draft proposal must be significantly strengthened. Our concerns can be grouped into seven categories, discussed below:

1. <u>Lack of Emphasis on Vegetation and Imperviousness</u>. The proposed standard is essentially a prescription to use a narrow range of engineered BMPs like raingardens and pervious concrete. It ignores (or at least de-emphasizes) the most crucial LID tools: protecting native vegetation and soils, and designing projects to protect natural drainage features and reduce impervious surface. Many commenters emphasized throughout the advisory group process that without protection of vegetation and reduction of impervious area, LID is simply a slightly less harmful version of conventional development. However, the draft proposal significantly deemphasizes these foundational LID approaches.

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We understand that Ecology's intention is that this issue is to be addressed primarily through code rewrites rather than site/subdivision-specific standards. There are two problems with relying exclusively on that approach. First, there is no standard whatsoever dictating what municipalities should seek to achieve, even a general or narrative one. For example, the permit could set a jurisdiction-wide standard of no net loss of forest cover and no net gain of effective impervious surface. Second, there should also be a directive at the site/subdivision scale to require developers to protect native vegetation and reduce imperviousness, to emphasize that this is a site-specific requirement as well as a jurisdiction-wide requirement.

While we appreciate the work done by the Puget Sound Partnership on its draft Guidance on integrating LID into local codes, it does not substitute for a clear directive in the Permit itself. The Guidance, while helpful in a number of respects, provides a number of ideas for jurisdictions to "consider," such as changing codes to allow for smaller streets and cluster development. None of these ideas are mandated by the Guidance, however, which is why the Permit must provide some standard like the one suggested above. To give just one example, techniques exist to develop streets that completely eliminate runoff in some situations (see, e.g., Seattle's "SEA Street" model). Use of the guidance does not clearly mandate use of such techniques in appropriate situations, as should be the case. Neither does the draft Permit.<sup>1</sup>

2. <u>Failure to Require LID at Small Projects</u>. In this proposal, small projects are exempt from all LID requirements in all situations. This is a major missed opportunity. We've previously endorsed a streamlined approach that uses some kind of checklist rather than a complex performance standard and engineering burdens for small projects, but strongly disagree that they should be exempt from LID altogether. In contrast, the City of Seattle proposal applies to all projects regardless of size. It is difficult to see how exempting small projects meets

If Ecology is unwilling to include standards in this regard—and it should not be, given how important they are to protecting water quality and the Sound—it should substantially increase incentives and emphasis on protecting native vegetation and reducing impervious surface throughout the permit. For example, Ecology should more clearly in the Permit (as opposed to the Manual) provide incentives to utilize 65-10-0 standards to achieve permit compliance.

Ecology's obligation to require LID where feasible. All sites, including small ones, should be required to do "site assessment" and a checklist review of LID techniques.

3. Failure to Apply Performance Standard Broadly and Inadequate "Mandatory List". The hydrologic performance standard—which we spent about 80% of the time in the advisory groups talking about—is only mandatory in this draft language on development projects over 5 acres, outside the UGA. There was very little support in the advisory groups for applying the standard so narrowly, and no identifiable reason for doing so. We have argued consistently for project proponents to demonstrate compliance with a clear performance standard, acknowledging "off ramps" for technical feasibility or for environmental/public safety reasons. This approach allows for broad application of various LID techniques while still recognizing the limitations of the site and other appropriate factors.

In place of an accountable standard, the proposal instead relies primarily on a mandatory "list" that essentially only includes rain gardens, permeable pavements and green roofs (the latter for commercial projects only). As noted above, the "list" does not include protecting vegetation and minimizing impervious area, nor does it include water harvest/reuse, or other LID approaches like pin foundations. The proposal does not include a requirement to consider green roofs for residential development and may do little to encourage commercial green roofs due to a conservative cost factor.

There was support in the advisory groups for using a mandatory "list" for small projects that fell below existing flow control thresholds. However, in this case the exception has swallowed up the rule. The issue is particularly concerning in light of the broad "feasibility" exemptions discussed below: without a duty to protect vegetation, amend soils, and reduce the footprint, it could easily become "infeasible" to achieve much through permeable pavements and raingardens. We recommend that an accountable hydrologic performance standard be applied for all projects above the existing flow control thresholds.

4. Overbroad Feasibility Offramp Criteria. PSA agrees that the Permit should include feasibility criteria to avoid situations where LID could cause problems, and many of the identified feasibility criteria are appropriate. But the proposed offramps in the feasibility criteria go a lot further, and have the potential to drastically undercut even the limited gains offered by the rest of the permit. Inappropriate exemptions include situations where soil drainage is slower (this would cover most of Puget Sound); where LID is not "compatible with surrounding drainage system" (providing substantial local discretion to excuse their use); and where there is a "lack of usable space" (i.e., why not require project design so that adequate space for LID is provided?).

The most concerning feasibility loophole has to do with "competing needs," including any state and federal requirement. Would this not allow jurisdictions to declare GMA density goals as a competing need that supersedes required implementation of LID? We don't believe

that there is a conflict, and recognize that the draft permit says as much, but the language seems to invite a declaration of infeasibility and there is little oversight to ensure that permittees are applying them properly. Another vague but potentially big loophole is exempting LID where it would conflict with "an existing development layout or aesthetics" mandated by code. It is difficult to determine what may be covered by this potential exemption, and hence it needs additional clarity and limits.

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Moreover, the fact that circumstances exist which make full application of LID unwise does not mean that some LID tools cannot be used. For example, even where slopes are steep or the groundwater is high, use of LID tools like proper site planning, reduction of impervious area and protection of vegetation and soils will provide significant benefits, and should be required. Where feasibility concerns are invoked, projects should still use LID tools to the greatest extent practicable consistent with those feasibility limits, rather than simply waiving all LID tools across the board.

- 5. <u>Lack of Mitigation</u>. Where an exemption is allowed due to feasibility concerns, there must be a requirement to mitigate for any adverse environmental impact that arises from the exemption. Similar requirements are part of other NPDES stormwater permits, and in this case would provide a significant additional protection for water quality as well as an incentive to ensure that LID is applied in as many situations as possible. We recommend that Ecology include a mitigation requirement for development situations where a variance or exemption is provided along the lines of the West Virginia Phase II stormwater permit (pages 15-16).
- 6. Excessive Timelines. Phase I and II jurisdictions would have to apply new permit requirements by August 2014 (over two years from permit issuance). Phase II jurisdictions would have until December 2015 (three and a half years). This is a highly excessive timeframe and there was very little support for moving this slowly in the advisory groups. Representatives of the regulated jurisdictions repeatedly indicated that they could move far faster than Ecology proposed. The Board's ruling came in 2008 and directed Ecology to modify the existing Phase I permit—Ecology is already far behind in implementing this requirement. At this point it should come as no surprise to anyone that these requirements are coming. Indeed, the PCHB interprets the existing permit as requiring LID now, and there is no reason to take so much time to meet new standards.

The timing problems are potentially compounded by the ambiguity surrounding Ecology's legal position about state vesting law. Ecology's historic position is that state vesting law applies to the requirements of stormwater permits. As you know, a recent PCHB ruling held otherwise. Prior to that decision, Ecology announced that it was not going to change its approach to vesting—and it is unclear what Ecology will do in this regard. But its historic approach would allow projects to lock in non-LID approaches to stormwater even though they will not be built for many years past the deadline. The timing problems are further adverse consequences for missing deadlines. In light of the excessive time used to develop this permit,

we suggest that permittees amend codes to meet the new standards within 12 months (Phase I) and 18 months (Phase II). Ecology must include a permit provision that permittees that fail to meet deadlines must not permit development projects that fail to meet permit standards.

7. Failure to Require Basin Planning. There is universal agreement that basin planning is a crucial strategy in these permits and in the recovery of Puget Sound. In fact, this was the lead recommendation by the National Academy of Sciences panel that critiqued the federal stormwater program. The basin planning proposal in here is far different than anything that was discussed in the advisory group process. While there is nothing objectionable in the proposal itself, it does not constitute and is not a replacement for proper basin planning. Permittees should be required to identify priority basins and develop basin plans that protect water quality throughout the entire basin. This process should include identification of vegetated cover and impervious surfaces goals that apply across the entire basin and are based on best available science, and cooperation with other permittees to meet these goals. We urge you again to consider including such a requirement. While we understand that Ecology does not wish to have jurisdictions revisit past planning efforts, it is indisputable that additional measures to restore vegetation and reduce impervious area at the basin level are going to be necessary to meet Puget Sound recovery goals. Having said that, we believe that the process outlined in Section 7 has some value. But the process outlined in the permit is vague and requires more work. Additional recommendations are made below.

#### II. ELEMENTS OF THE PROPOSAL THAT WE SUPPORT.

- 1. <u>Elimination of One-Acre Threshold</u>. This exemption has meant that the Phase II Permit fails to regulate the majority of new and re-development except where the jurisdiction chooses to do so. Such development is a major source of water quality problems and regulating to the Manual's standards constitutes AKART and MEP. Ecology made the correct decision in proposing to eliminate this threshold.
- 2. <u>Decoupling Permit From GMA Timelines</u>. Ecology's last LID proposal proposed to explicitly link code reviews to GMA planning deadlines. Where a permittee chooses to do this for its own purposes, it is unobjectionable, but we agree that a firm deadline should be included in this permit.
- 3. <u>Elimination of Exemptions</u>. Ecology's last proposal included exemptions for flow control exempt and highly urbanized areas. These appear to have been removed, which is appropriate. If we are mis-reading the proposal in this regard, please let us know.

# III. SPECIFIC QUESTIONS/RECOMMENDATIONS.

#### A. Preliminary Draft Language (Phase I and II).

Section 5.b.iii (Code Review). The language in this provision is vague and potentially difficult to enforce. Rather than saying that LID will be "preferred and commonly used," the Permit must say that LID is mandatory except where infeasible. Instead of saying permittees shall "look for" opportunities to minimize loss of vegetation, etc., it should say permittees "shall" amend codes to "require" protection of vegetation and minimization of imperviousness. It should also clarify that developers may not seek to invoke "feasibility" exceptions by failing to design the project to reduce imperviousness and protect vegetation.

Section 5.c (Stormwater Planning). While we have significant concerns with the process outlined in this section in lieu of real basin planning, we have some suggestions to make it more useful. First, the permit should clarify that the analysis required in § 5.c.2 should be available for notice and comment to the public, and all final analyses should be posted on permittee websites. Moreover, the substantive standards about "compliance with water quality standards" should be clearer that the action cannot proceed if the analysis shows degradation of water quality, any increased discharges to 303(d) listed streams, or any contributions to a water quality standard violation.

#### B. <u>Draft Revisions to Appendix 1</u>.

Section 4.1. This provision requires application of development principles to "retain native vegetation and minimize impervious surface." Most experts agree that retention of native vegetation and limits on impervious surfaces are the two most effective LID techniques that can be employed on a site. In the absence of a standard, this vague statement will not help developers or jurisdictions remain in permit compliance. Ed O'Brien stated at the last advisory group meeting that this standard does not place any actual limits on clearing. He later admitted that the requirement could be swallowed up by project design exemptions discussed below. What value does this "requirement" have then? Again, we think the best way to approach this issue is through application of a science-based performance standard to all but small sites, creating an incentive to retain native vegetation and reduce impervious surfaces on site, and use engineered BMPs to address the significantly reduced runoff that results.

Also in this section or accompanying section in the manual, there should be greater specificity that the site plan include a site assessment to identify natural features, such as vegetation and wetlands, that would be beneficial to maintain on-site. The site assessment should also identify existing impervious surfaces, lot lines, easements, and other relevant site characteristics. Site assessment is emphasized in the Partnership's Draft LID for Local Governments Guidance and should be a mandatory part of this Permit.

Section 4.5. There are various lists of BMPs in this section for projects of various thresholds. Again, this approach fails to recognize variations between sites, applying a "one size fits all" approach to all projects of a given size. Moreover, the lists are, as discussed above, incomplete. A number of well accepted and effective LID techniques are excluded. Since all parties in the advisory groups agreed that not every site should be required to apply all LID BMP's, the "mandatory list" approach results in the lowest common denominator approach: a requirement for pervious pavement with, in most cases, limited application of rain gardens. This approach is certain to fail in terms of achieving water quality and habitat goals. Each list should, for example, include a meaningful requirement to protect vegetation and reduce impervious surface, and apply LID site design principles to the maximum extent feasible. Both this section and § 4.7 should make clear that compliance with LID requirements and flow control requirements is presumptively achieved at any project meeting a 65-10-0 standard.

Section 6. With the addition of the LID feasibility criteria in § 8, it appears that there could now be two different mechanisms to circumvent the requirement to implement LID. We suggest that § 6 apply only to the non-LID minimum standards, and § 8 be reserved for LID feasibility. In either event, variances from requirements to protect water quality need to be mitigated by the permittee or project proponent. Information regarding exceptions or variances should be publicly available on the permittee website and annual reports.

Section 7. We do not support the use of basin planning to "tailor" the site/subdivision LID requirement. This approach has not been discussed in any forum and we are not aware of any support for the idea of waiving site/subdivision LID requirements through basin planning. We are not aware of any reason why the LID requirement should be waived or "tailored" to local circumstances, except where needed to strengthen it. Moreover, Ecology's experience with Clark County's failed effort to adopt a local standard demonstrates that this Permit provision needs to be significantly strengthened in order to work properly. For example, Ecology should make clear that the ONLY way to obtain a locally-tailored standard is through proper basin planning.

Section 8. A number of the feasibility criteria are poorly defined and open-ended, leaving open the possibility that permittees or individual project proponents could circumvent the LID requirement. This is, in part, why a mitigation requirement for any feasibility waivers is so crucial. We are concerned with the following:

A. It makes no sense at all to exempt sites where conductivity is less than 0.15 inches per hour. As Curtis Hinman stated at the last advisory group meeting, it is simply not a true statement to say that rain gardens don't work in these soil conditions. Where soil conductivity is low, greater use of other LID principles will be required, including amendment of soils and larger rain gardens.

- B. There should not be an exemption for "lack of usable space" for raingardens, even in redevelopment sites. If there is insufficient space, the project will have to be redesigned to meet the standard. This feasibility exemption is an invitation for project proponents to design projects with little effort at reducing impervious area.
- C. The exemption where LID is not "compatible with surrounding drainage system" needs substantially greater detail. We are concerned that a feasibility exemption that is intended to be technical could be read so broadly as to include, for example, aesthetic compatibility or other non-technical considerations.
- D. Use of permeable pavements should not be exempted due to soil suitability criteria. Rather, it should be mandatory to amend soils or use of other materials to meet the standard.
- E. We are particularly concerned about the concept of a broad "competing needs" feasibility offramp. Without additional direction, permittees or project proponents could invent perceived conflicts between state and federal requirements in order to avoid LID standards. If Ecology is unable to identify what specific "competing needs" it is concerned about, there appears to be little reason to include this exemption in the Permit. Provisions such as "incompatible with an existing development layout" are vague and would likely lead to broad exemptions from LID requirements.

Additionally we strongly urge Ecology to include robust public oversight and accountability measures into §§ 6-8, by requiring public notice and comment periods where appropriate, and mandating that any proposed feasibility exemptions, variances or locally-tailored plans be posted on permittee websites (and/or Ecology's website). Approvals by Ecology, where required, should also be posted publically. Given the lack of adequate staffing at Ecology, the public will play an important role in overseeing the implementation of these permit provisions.

If you have any questions about these comments, please contact Jan Hasselman at (206) 343-7340 ext. 1025.

Sincerely,

Jan Hasselman

Earthjustice

705 Second Avenue, Suite 203

Seattle, WA 98104



# **CITY OF RENTON**

**City Clerk Division** 1055 South Grady Way Renton, WA 98057 425-430-6510

Receipt	

2220

Date 9-24-15

☐ Cash ☐ Check I	No. 1029	☐ Copy Fee ☐ Appeal Fee	☐ Notary Service ☐
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